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ORIGINAL COMMUNICATIONS.

ART. XXXVIII.—OBSERVATIONS ON DEXTRINE AND
DIASTASE. By WILLIAM PROCTER, JR.

Few subjects of the same extent have created more sensation, or have excited more difference of opinion, than *amidon*, and the substances which either constitute it proximately, or are derived from it by chemical agency. Ever since the discovery, by M. RASPAIL, that the grains of *fecula* were real organs, and not a homogeneous proximate principle, as was before supposed, numerous writers and experimenters have engaged in the question as to what is its chemical constitution? And so various have been the views entertained by many of these, that the task now undertaken, which is to give an outline of the history of the subject, and make such experiments as may assist us in arriving at the truth, so far as it has yet been developed, is one that requires no little industry and perseverance.

As early as December, 1825, M. RASPAIL announced, in the *Annales des Sciences Naturelles*,* that *fecula* of potatoes was composed of two parts, one soluble, and the other insoluble in water. This naturalist stated that the last enveloped the

*The short historical notices of the several writers following, were obtained from a paper, by M. Guérin Varry, *Ann. de Chem. et d'Phys.* tome lvi.

first, which he considered to possess all the characters of gum arabic.

M. CAVENTOU, in the *Annales de Physique et de Chemie*, tome xxxi, 1826, contradicts the opinion of M. RASPAIL, and is persuaded that amidon is a proximate vegetable principle, *pure and homogeneous*.

M. GUIBOUT, in the same work, vol. xl, 1829, thought that the two parts of amidon differed more in their form than in their chemical nature, and under this relation he regarded them as constituting only one immediate vegetable principle.

In 1829, M. CHEVREUL, according with the discovery of M. RASPAIL, ceased to consider amidon as one kind of proximate principle, but he did not admit with him that the soluble matter was *gum*, since it did not possess the property of yielding mucic acid, and he designated the soluble part, under the name of *amidine*, and the insoluble portion by that of *amidin*.

MM. BIOT and PERSOZ, (*Nouvelles Annales du Museum*, tome ii, 1833,) fully admit with M. RASPAIL that amidon is composed of two bodies; considering, however, the soluble portion as a pure substance, distinct from *arabine*, to which they gave the name of *dextrine*, by reason that a ray of polarized light deviates strongly to the right in passing through a solid and limpid plate of this substance, or its aqueous solution.

M. BIOT states, in a note attached to the above paper, that to prevent all confusion, M. PERSOZ and himself thought it best to change the name of the soluble matter of fecula, after they had isolated it in sufficient quantities to ascertain all its characters, and to designate it by the property which it possessed of turning the planes of polarization to the right, as has been said, stronger than any other organic substance known.

This power or property, in substances, M. BIOT called *polarization by rotation*, and M. FRESNEL, *circular polarization*.

M. BIOT, in his researches on the rotatory power of various vegetable juices, as beet, carrot, radish, etc., ascertained that this property was increased by boiling the juice with the pulp, and he attributes it to the liberation of dextrine from the

fecula of the pulp. It is for this reason that M. BIOT, believes that boiling roots for feeding cattle increases their power of nourishment, and renders them more digestible.

MM. BIOT and PERSOZ, in their memoir on the modification of fecula and gums by diluted acids, state that sulphuric acid has the power to rupture the teguments of fecula, and liberate the dextrine, when fecula mixed with water is thrown into a boiling mixture of sulphuric acid and water, and the whole mixture then raised to 196° Fahr. They also say, that by boiling the rotatory power is much diminished. When this solution is filtered and added to a large quantity of alcohol, a white flocculent precipitate falls, which is dextrine. When pure dextrine is dissolved in water, and the solution filtered so as to obtain a perfectly limpid solution, and then abandoned to itself, either with or without contact with the air, a white substance gradually precipitates, which has the appearance of inulin. It is not inulin, because, when dissolved in hot water, it turns the planes of polarization to the right, whereas inulin turns it to the left. M. BIOT considers this substance a modification of dextrine.

In conclusion, M. BIOT believed that the acid, by the aid of heat, first ruptured the teguments of the globules of fecula and sets the dextrine free, and then, if the heat was continued, acted on the dextrine, and converted it into sugar of amidon, without the acid communicating any of its substances to the product.

In a letter addressed to the French Institute, 1st April, 1833,* M. GUERIN, announced his having obtained several interesting results with amidon, as follows: that *tegumentary amidon* has the same chemical composition as lignin, and that the *soluble matter* of M. RASPAIL was composed of two substances, *amidine* and soluble *amidin*; the first soluble in cold water, and the second insoluble in water, either hot or cold, but capable of being held in solution through the intervention of *amidine*.

*Annal. de Chem. et de Phys. tome lx, 1834.

MM. PAYEN and PERSOZ, in a letter addressed to the Academy, dated 8th of April, that is to say, eight days after the letter of M. GUERIN, announced the discovery of *diastase*, the active principle of *malt*, and of the property it possessed of breaking or decomposing the globules of *fecula*, and setting at liberty the soluble matter, or *dextrine*. "This substance," (*diastase*,) they say in their letter, "contains the less azote as it approaches a state of purity, and possesses besides the following properties: it is solid, white, insoluble in alcohol, soluble in water; its solution is neuter, and its taste marked; it is not affected by the subacetate of lead; abandoned to itself for some time, it becomes acid; heated to 150° or 160° Fahr., with *fecula*, it possesses the *remarkable power* of breaking, instantly, the envelopes, and setting at liberty the *dextrine*, which dissolves easily in water, whilst the teguments, insoluble in this liquid, float or precipitate according to the density of the liquor. This operation, properly managed, gives *pure dextrine*, which possesses a great power of rotation, unequalled by that obtained by any other process. When *diastase* is present in a solution of *dextrine*, it always converts the latter substances into sugar, provided the temperature is not elevated during their contact above 160° or 170° Fahr., because, if heated to ebullition, it loses the property of acting on *fecula* and *dextrine*."

"*Diastase* exists in the germinated seeds of barley and wheat, and in the germs or *eyes* of the potatoe, (*Solanum tuberosum*,) where it is always accompanied by an azotized substance which is soluble in water, insoluble in alcohol, capable of being coagulated by heat, incapable of acting on *fecula*, and of being precipitated from its solution by subacetate of lead."

The following is the process for preparing *diastase* announced by PAYEN and PERSOZ in the same communication:—One part of malt (*d'orge germée*) is reduced to powder, and mixed in two and a half parts of distilled water. After macerating for a few minutes, the mixture must be thrown on a filter. The liquid thus obtained is to be heated to 150° Fahr., when the azotized substance is coagulated, and can be separated by filtra-

tion. The liquid then contains diastase and sugar, in quantity in proportion to the action of the diastase on the dextrine of the malt in the germinating process. It is then precipitated by alcohol, which holds the sugar in solution. This precipitate should be redissolved and again precipitated to obtain it pure.

In a subsequent communication,* PAYEN and PERSOZ state that the soluble matter obtained according to their process is not a pure substance, but is constituted of dextrine, (properly speaking,) sugar, and a substance analogous to inulin.

In a yet more recent communication† PAYEN and PERSOZ declare that *fecula* is composed of *amidone* and *teguments*, and hence they say *amidone* is a natural product, and can be obtained by means of water alone.

Amidone is insipid, neuter, without color, diaphanous, elastic, and tenacious. It is insoluble in cold water, but swells exceedingly, and appears in solution; and in this state forms a blue color with iodine, is precipitated by tannin, infusion of galls, subacetate of lead, lime, and baryta. The barytic compound is soluble in an excess of either hot or cold water, and by precipitating the baryta with a reagent, the *amidone* can be obtained in so minute a state of division that its combination with iodine is not precipitated by saline solutions.

It can be obtained by boiling one part of *fecula*, in 100 parts of water, filtering through a double filter, and evaporating carefully to dryness; redissolving, filtering, and again evaporating to dryness; the product is *amidone*.

Diastase, in its action on *fecula*, converts the *amidone* into gum, or dextrine and sugar. The dextrine and sugar obtained by diastase, are not precipitated by tannin, subacetate of lead, lime, baryta, or infusion of galls. The sugar can be separated from the dextrine by alcohol of .84. It has a very sweet taste, and ferments with yeast, yielding alcohol and carbonic acid, which is not the case with dextrine. It is dextrine which communicates to beer the mucilaginous property

*Journal de Pharmacie, Mai, 1834 (note by Soubeiran.)

†Annales de Chemie et de Physique, tome lvi, Aout, 1834.

which holds the carbonic acid, and which gives to the froth its persistence.

The teguments contain carbonate and phosphate of lime and silica.

The jelly (*empois of the French*) yielded when fecula is boiled in water, is accounted for by the swelling of the amidone when in contact with the water, after the rupture of the envelopes. When diastase is added to this gelatinous mass, it has the singular property of destroying its spongy organic character, and of rendering it perfectly soluble by converting it into dextrine, and sugar.

In conclusion, MM. PAYEN and PERSOZ remark,—

1st. That the fecula of the grains and potatoes are formed of *amidone* and *teguments*.

2d. That the teguments vary in different feculæ, by the presence and proportion of an acrid, disagreeable, tenacious substance, which communicates to them their special taste.

3d. That in the action of water, lime water, iodine, baryta, and diastase, these substances pass through the envelope.

4th. That amidone is chemically identical in different feculæ, but varies in its volume and cohesion.

5th. That it is *insoluble in the cold*, but allows water to penetrate between its particles, and swell them by degrees.

6th. That it is spongy in its texture, and when considerably broken up by strong ebullition, in 100 times its weight of water, it appears to be really dissolved, and passes the filter.

7th. That the previous observations explain the formation of jelly, and its different characters when obtained from different feculæ.

8th. That the teguments, entirely deprived of amidone, do not yield a blue color with iodine.

9th. That amidone *alone*, in fecula, produces alternately, the phenomena of coloration and decoloration, of opacity and diaphaneity, by iodine, alcohol and water.

10th. That amidone *only* of fecula, is transformed into sugar, and gum, by the influence of diastase, water, and temperature,

and that the sum of the weights of the sugar, and gum, or dextrine, equals the weight of the amidone.

11th. That in the preparation of beer, it is important to effect the entire transformation of the amidone, into dextrine and sugar; so that the transparency of the fluid will not be troubled afterwards, which would be the case if amidone was present.

12th. That in the first developement of certain plants, the diastase is placed precisely at the point where the fecula ought to be rendered assimilable so as to transform the insoluble fecula into two soluble substances, capable of being absorbed by the plant.

13th. That diastase only transforms amidone, as it is without action on gum, (properly so called,) inulin, albumen, gluten, teguments, and lignin.

14th. That during the process of germination, the proportion of the diastase increases with the developement of the gemmule.

15th. That amidone forms about .995 of fecula, while the teguments deprived of all amidone make up the remainder.

Finally, that diastase has become an important agent in the chemical analysis of fecula, and forms an easy means of making commercial dextrine.

M. GUERIN says, that he followed M. CHEVREUL in naming the principles which he has described,* that is to say, *amidine* to the portion of fecula soluble in cold water; *tegumentary amidin* to the part insoluble in either cold, or boiling water; and *soluble amidin*, to prevent all confusion, to the part which is held in solution by amidine, and which is identical in chemical composition with tegumentary amidin.

The amidine of GUERIN, is made by boiling fecula in a large quantity of water for a short time, allowing it to stand until the teguments precipitate, filtering, and evaporating the filtered liquor to a syrupy consistence, when a precipitate gradually forms, which is to be separated by a cloth, and the

*Annales de Chim. et de Physique, tome lvi.

liquid again evaporated, continuing the process, until it ceases to yield the insoluble matter. When finally evaporated to dryness, the residue is completely soluble in cold water. M. BIOT found a solution of this substance to possess the rotatory power three times more powerfully than sugar.

It renders cold water very mucilaginous, is insoluble in alcohol and sulphuric ether: its aqueous solution becomes acid, after standing many days, and its transparence is troubled.

Treated with nitric acid, it gives first oxalhydric, and afterwards oxalic acid.

100 parts of amidine, and 250 parts of sulphuric acid, at about 150° Fahr. have yielded 95.8 parts of anhydrous sugar.

M. GUERIN says that this substance differs much from the dextrine of BIOT and PERSOZ, because, according to their memoir, they assign as one of its chemical characters, fermentation with yeast, which amidine does not. He prepared some of their dextrine, and found that it did ferment with yeast; but suspecting that it owed this property to sugar, he treated it with alcohol and found that it lost this property, and acquired that of coloring blue with iodine, instead of vinous red or purple. Thus deprived of sugar by alcohol, continues GUERIN, it is yet composed of two substances, one soluble and the other insoluble in cold water. BIOT and PERSOZ say, that their dextrine is the same as that made with boiling water alone, which corresponds with the declaration before mentioned of PAYEN and PERSOZ, that the substance obtained by diastase is composed of dextrine, sugar, and substance analogous to inulin.

Tegumentary amidin, of GUERIN, dried at 212° Fahr. has a light yellow color, neither odor, nor taste, without action on paper reactives, gives a beautiful blue color with iodine, is insoluble in water, either cold or boiling, alcohol, or sulphuric ether, and when left long in contact with water, swells, but is not altered.

Soluble amidin, of GUERIN, is the substance precipitated from the aqueous solution of amidon, in the process for preparing amidine; and according to that chemist, it is chemically

identical with tegumentary amidin. He also observes that fecula is composed of—

Tegumentary amidin,	2.2	} 100.00
Soluble amidin,	38.68	
Amidine,	59.12	

GUERIN also queries whether his tegumentary amidin is identical with lignin, and owes its property of coloring blue with iodine to a small quantity of adhering amidine, or whether it is merely isomeric with that substance.

We have now gone over most of the writers on the subject before us, and have unfolded their several views as concisely as possible. It now remains to give the ideas of M. RASPAIL, the latest writer on the subject, whose work has come to hand. He differs widely in his opinions from most of those which we have detailed, and it is proper that they also should be exposed; avoiding, however, the many sarcastic remarks with which his pages are interspersed, we shall endeavor to place his views in as clear a light as possible.

According to this writer, fecula consists of soluble matter and teguments; the latter enveloping the former; the one entirely insoluble in water, and the latter very soluble in that fluid. To the soluble matter he gave the name of *soluble substance of fecula*; and to the insoluble portion, *teguments*; stating, at the same time, that the latter consisted of the outer envelope, and an interior tissue, which, from its extreme tenuity, was capable of being diffused through the solution of the soluble substance, so as to appear in solution, though it really was not, and in time was wholly deposited.

He queries what is the *dextrine* of BIOT?* and answers that it is the *soluble substance* of fecula.

He again queries what is the *diastase* of PAYEN and PER-soz? after speaking of the unhappy application of this word to the substance in question, which signifies division, or separation, and is already used in chirurgy to signify *luxation*, he remarks, that the diastase of these chemists is distinguished

*Nouveau Systeme de Chimie Organique, tome i, art. Amidon.

by two properties new in science, and extremely remarkable: the first is its power of breaking the integuments; the second is that of saccharifying fecula. Now unhappily the first property is possessed by pure water, which, when heated to a certain degree, and fecula is thrown into it in small quantities, the envelopes are burst, and the soluble substance is liberated. After standing, the teguments subside.

"The second property," continues RASPAIL, "which consists in saccharifying fecula, is highly interesting, and is incontestible, but unfortunately it is nothing new. It belongs in justice and without any modification, under an economical relation, to those who have invented and perfected the art of fabricating beer; and under a scientific relation, to KIRCHOFF, who demonstrated by the most varied experiments, the influence that, not only glutinous substances, but solution of malted barley, that is to say, germinated barley, exercised on the saccharification of fecula."

PAYEN and PERSOZ say, that their diastase is not gluten, because it is soluble in water, which is not the case with that substance.

RASPAIL then observes that "gluten is soluble to a certain degree in water saturated with an acid, or ammonia; now in organized nature so abundant in acid, and ammoniacal products, gluten ought often to be presented under this soluble form, and it has not escaped anterior observations. Thus, before the name of *diastase*, it had received the name of *soluble gluten*, properly so called by EINHOF and BERZELIUS, that of *zimome* by TADDEÏ, and that of *legumine* by BRACONNOT.

RASPAIL then remarks that in 1826 and 7 he demonstrated that grain, in germinating, produces an energetic acid, which is the acetic, and that then the gluten loses its consistence, and the feculent perisperm becomes milky, which is affected gradually by the acetic solution of gluten, and the teguments are emptied of the soluble substance. The results of the action of gluten on fecula, is to transform it into sugar, then into alcohol, and lastly into acetic acid. The brewers arrest the fermentation at the two first phases. They cause the barley

to germinate until the plumule has attained a little greater length than the grain, then dry it and reduce it to powder, and then dissolve it in warm water. The meal thus obtained is *malt*, and the solution, which is the saccharifying agent of the brewers, is the *diastase*, the *zimome*, and the *legumine* of others. The diastase, therefore, of PAYEN and PERSOZ, is only a mixture, more or less variable and complex, of sugar, gum, soluble substance of fecula, oil, salts, and finally gluten, to which belongs specially the saccharifying power. Again our author queries:

“What is the *amidine* of GUERIN?”

“It is the *soluble substance* that we have discovered in fecula, that we have designated under the name *gummy substance*, to which BIOT has believed it his duty to give the name of *dextrine*, a name which PAYEN and PERSOZ have added to the soluble substance altered by the malt of beer, which they have since abandoned for that of amidone.” This is incorrect, as they do not use diastase in the preparation of amidone.

“What is the *tegumentary amidin* of GUERIN?”

“It is the assemblage of the envelopes of fecula, that we have designated under the name of *teguments*.”

“What is the *soluble amidin* of GUERIN?”

“It is the same, according to him, as tegumentary amidin, which amidine holds in solution, and which according to the same author is identical in all its relations with tegumentary amidin; thus we have two substances which are identical, and different, and one substance which changes its name according as it is dissolved or undissolved.”

“It is the interior tissue spoken of before, which from its extreme tenuity passes the filter, and appears dissolved, but which precipitates by time, that GUERIN has given the name of soluble amidin.”

Perhaps it will give a better idea of these substances by presenting them in the following classification, viz.:

RASPAIL,	teguments, interior tissue,	{ soluble substance or gummy substance.
BIOT & PERSOZ,	teguments,	{ substance ana- logous to inulin, dextrine.
GUERIN,	{ tegumentary amidin,	soluble amidin, amidine.
PAYEN & PERSOZ,	teguments,	amidone
		substance analogous to inulin. dextrine or gum.

By scrutinizing the foregoing remarks, we will observe a great confusion of names, indeed almost as many sets of names as we have experimenters on the subject. There is evidently an analogy between some of the results, and the probability is, that the amidine and soluble amidin of GUERIN, taken together, constitute the amidone of PAYEN and PERSOZ, as both amidine and amidone, color blue with iodine, and both are obtained without the use of any other agent but water and temperature. The matter of amidone which causes it to swell, may be a tissue-like substance, which, when separated by ebullition, etc., constitutes the soluble amidin held in solution by amidine of GUERIN.

I think we may safely differ from RASPAIL, who considers the dextrine by sulphuric acid of Biot, to be the soluble substance of fecula. Dextrine when obtained in that way, as well as by diastase, gives a vinous red or purple hue with iodine, while the substances which are derived directly from fecula by water give a sky blue.

RASPAIL says, that all, save the teguments of fecula, is soluble substance, an assertion which is not borne out by fact, for we find that amidone is not soluble.

He also asserts, that diastase is soluble gluten, or gluten held in solution by acetic acid. Wishing to test the truth of this assertion, some gluten was prepared and dissolved in acetic acid. This, then, should possess the power of diastase. Two drams of fecula were mixed with two ounces of water, and as much solution of gluten as equalled two or three grains of the undissolved substance was introduced along with it, and

the temperature raised expecting to see the reactions peculiar to diastase, but was somewhat disappointed when the mixture became gelatinous and exhibited no signs of alteration. At this crisis half a grain of diastase was added, dissolved in a very minute portion of water; the mixture in a very short time was sufficiently fluid to filter. If the acetic acid solution of gluten was prepared correctly, and there is every reason to believe that it was, this assertion of RASPAIL proves incorrect.

RASPAIL also asserts, that diastase and sulphuric acid possess no power of rupturing the envelopes of fecula, but that it is due to the water and temperature. To ascertain how far this was correct, 240 grains of fecula about 1000 grains of water, and half a grain of diastase, were mixed together, and heat gradually applied. At the temperature of 150° Fahr., the mixture had a gelatinous consistence owing to the rupture of the envelopes, and the liberation of the interior substance. Again; the same quantities of fecula and water were mixed together *without* the diastase, and the temperature raised as before. At 150° Fahr., the mixture becomes gelatinous as in the other case. To this one-third of a grain of diastase mixed with half a dram of water was added, and the whole stirred together. In a very short time, the mixture lost its jelly character, and was quite fluid. From this it may clearly be inferred, that water and temperature, as has been said by RASPAIL, are *really* the agents which rupture the envelopes. It may be well to remark, that the jelly of that in which diastase was used, was not so thick as the other, which may be traced to the immediate action of the diastase on the first portion of broken granules.

Preparation of Dextrine.

First, by sulphuric acid.

The proportions recommended by different chemists are exceedingly variable, as are the processes. Berzelius directs.

Fecula	50 parts.
Acid	20 “
Water	139 “

Mix the fecula with one-half of the water, and the acid with

the other; first heat the diluted acid, and add the fecula and water, in small quantities at a time, then raise the temperature to ebullition, and keep it there a few minutes. Afterwards saturate the acid with marble dust; filter, and evaporate carefully to dryness.

*THENARD says, take one hundred parts of fecula, twenty-eight of water, and twenty of acid, which is evidently a mistake, as the quantity of water is entirely too small. The dextrine obtained by the process of BERZELIUS is very soluble in water, and colors vinous red with iodine. According to M. T. THINUS, (*Journal de Pharm.* tome xx,) the following are the most eligible proportions:

Fecula 50 parts.

Acid 10 “

Water 600 “

I have used these proportions in preparing it, and found them to answer very well; mix the fecula with one-half of the water, and the acid with the other, and apply heat, taking the precaution to keep the mixture in constant agitation, at 150° or 160° Fahr., the whole becomes a jelly, which gradually becomes more fluid, until the temperature arrives at 196°. Keep the mixture at this degree for some minutes, and then allow it to stand twenty-four hours, when it is to be filtered. On adding an excess of alcohol to this solution, the dextrine is precipitated in a flocculent state, which aggregates in a cohesive mass. Thus obtained, it retains a small quantity of sulphuric acid, mechanically, which by re-dissolving in a small quantity of water and again precipitating, yields the dextrine pure.

This process might be altered so as to saturate the acid with marble dust, and evaporate the solution to dryness, after filtering.

2d. A much easier, and more eligible process is that in which diastase is used as the agent. The following proportions have yielded a satisfactory result, viz.:

Diastase 1 part.

Fecula 400 “

Water 1200 “

**Traité de Chimie*, tome iv, page 371.

Dissolve the diastase in the water, then add the fecula, and raise the temperature gradually, stirring the mixture constantly. At 150° the whole becomes a mass of thick jelly, which liquifies entirely between 150° and 160° Fahr. When this has taken place, raise the temperature of the mixture rapidly to ebullition, which suspends the action of the diastase on the dextrine. Floating through the liquid is seen a flocculent substance, which is composed of the empty teguments, upon which the diastase has no action. After the liquid has cooled, filter it, and either precipitate with alcohol, or evaporate carefully to dryness. The advantage of using the alcohol is the separation of the sugar, which invariably attends the action of diastase.

I think that we may draw from the foregoing exposition the following conclusions, viz.:

1st. That fecula consists of teguments, which envelope a peculiar substance of a spongy character, which is either one uniform matter, or composed of a soluble and an insoluble substance united.

2d. That dextrine, or gum of fecula, is always a product of art, and is derived from the interior substance of fecula, by the action of different agents.

3d. That diastase and sulphuric acid, and other agents, that are thought to exercise the power of rupturing the envelopes of fecula, do not really possess that power, but the water and temperature cause them to be ruptured, and then these agents act on the interior substance, and convert it into dextrine and sugar of amidon, thus destroying the gelatinous consistence of the mixture.

4th. That diastase is not soluble gluten, as asserted by RASPAIL, but is a substance enjoying the power of converting the interior substance of fecula, first into dextrine, and afterwards into sugar of amidon.

ART. XXXIX.—OBSERVATIONS ON LOBELIA CARDINALIS.

By WILLIAM PROCTER, JR.

LOBELIA inflata is the most important individual of this genus, yet thinking that the plant under consideration might possess a similar constitution, though less active, the following experiments were undertaken to ascertain the truth of that supposition.

The sequel will demonstrate, that the active principle of this plant possesses many of the characteristics of *lobelina*, the active portion of *Lobelia inflata*, while the medicinal power of the one is so inferior to that of the other, as to warrant the existence of two distinct principles.

BOTANICAL HISTORY.

LOBELIA cardinalis.

Natural Family *Lobeliaceæ*, of JUSSIEU and LINDLEY.
Pentandria monogynia, of LINNÆUS.

This genus is distinguished by a five-cleft calyx, five-parted corolla, irregular, cleft on the upper side nearly to the base; anthers cohering; stigma two-lobed, and capsules two or three celled.

Vulgar names. Cardinal Plant, Cardinal Flower, and Scarlet Lobelia.

Lobelia cardinalis. This plant has a fibrous root, similar to that of other species of the genus, which is whitish yellow, having a nauseous disagreeable taste, somewhat similar to that of the *inflata*, though in an inferior degree. The stem is erect, simple, pubescent; leaves lance-ovate, acuminate, denticulate; racemes somewhat one-sided, many flowered; stamens larger than the corols.—EATON. BARTON. The whole plant emits a milky acrid juice when wounded, though the root is more pungent than any other portion.

This plant, in favorable situations, sometimes attains the height of four feet, though generally not more than two. It grows in wet or very damp places, along the margins of

streamlets, and is one of the most showy of our native plants. It blooms from the last of July till September.

This plant has attracted little notice in a medicinal point of view; its chief claim as a remedial agent seems to be the anthelmintic powers which are ascribed to it by the Cherokee Indians. Dr. W. P. C. BARTON, however, from all he has learned, considers it deserving of further attention from medical practitioners.

CHEMICAL HISTORY.

As it is interesting, as well as sometimes important, in a chemico-botanical point of view, to be acquainted with the proximate constituents of plants that exist independently of the active principle, it may add to the interest of this statement to enumerate the experiments that have been made to ascertain them.

1st. A concentrated decoction of the plant was treated with ferrocyanuret of potassium, bichloride of mercury, iodine, and solution of gelatin, without producing any alteration, and hence it contains neither vegetable albumen, starch, nor tannin.

2d. When the subacetate of lead is added, a precipitate, the compound of oxide of lead and *gum*, immediately is separated.

3d. A portion of the plant was subjected to distillation with water: the product was devoid of taste, but had a very slight odor, so that volatile oil, if a constituent, exists in very minute quantity.

4th. Half an ounce of the plant was macerated in four ounces of alcohol, 36° Baumé, for three days; part of this tincture was subjected to distillation till half reduced, the residue was mixed with twice its bulk of water, when a copious precipitate of green resin and chlorophylle resulted, which was separated by a filter. The distilled liquid, which was nearly pure alcohol, had very little if any odor that did not belong to that fluid.

5th. A portion of the plant was macerated in sulphuric ether, and the ethereal tincture evaporated; the residue was

of a dark green color, communicated a permanent greasy stain to paper, and was evidently a combination principally of oily matter, and chlorophylle.

Four ounces of dried *Lobelia cardinalis*, were macerated for twenty-four hours in twelve ounces of water, acidulated with half a drachm of acetic acid; and then thrown on a displacement filter, and treated with water, till twelve ounces of fluid were obtained. This liquid had an unpleasant narcotic odor, and a disagreeable taste. It was then treated with pure magnesia to saturate the acid and again filtered. The product was then treated with sulphuric ether, 60° Baumé, the whole being well agitated together, and allowed to rest. The supernatant ethereal solution, which possessed a gelatinous consistence, was then decanted, and after standing a few hours regained its fluidity. This, when evaporated, yielded a small quantity of light brown matter, which was possessed of the following characters.

It had a bitter, acrid taste, sensible for some time in the mouth, slightly affecting the fauces, in which respect it differs from *lobelina*, which pointedly effects that part. It has a somewhat aromatic odor; the consistence is that of thick honey; and after a long exposure to the atmosphere, it evinced no disposition to crystallize, though it gradually became less fluid. This substance has a very decided alkaline reaction on reddened litmus paper, saturates acids, and with them forms crystallizable salts. It is very soluble in ether, alcohol, and oil of turpentine, but less so in water. Its specific gravity is greater than water, as it sinks rapidly in that fluid. When heated gently on the point of a rod, it becomes perfectly fluid, and when a lighted taper is applied it burns freely with a light flame.

It combines with acids as follows:—

The sulphate is in acicular crystals, devoid of odor, but retaining a taste similar to its base, and very soluble in water.

The nitrate takes the form of prismatic crystals, thicker than those of the sulphate and very soluble in water.

The hydrochlorate readily crystallizes in flattened needles

radiating from a common centre, and like the rest very soluble in water.

The acetate is more soluble and less disposed to crystallize than either of the other salts.

The great similarity between this principle and lobelina makes it a matter of some interest to be able to draw the line of distinction between them, so as to ascertain whether they are in reality but one substance, or two.

To do this with satisfaction, it would require much larger quantities of the plant than has been the subject of these experiments, so that the amount of active principle would justify a more extensive scrutiny than I have been able to make.

The root evidently contains a greater proportion of this principle than the upper part of the plant, and it is probable that the seeds are yet more active though they have not been tried. Should future experiments demonstrate the identity of the two principles, the name is already given, but if the contrary, *lobeliana* might be a suitable cognomen.

From the foregoing remarks the principle constituents of *Lobelia cardinalis* are *gum, resin, or chlorophylle*, probably *volatile oil, fixed oil, and a peculiar alkaline principle*, to which may be added salt of lime and potassa and lignin.

ART. XL.—REMARKS ON BROWN MIXTURE.

By AUGUSTINE DUHAMEL.

THERE is a preparation, in general use in this city, which, though not officinal in any of the Pharmacopœias, may yet be found in almost all of our drug stores. It is a compound solution of Liquorice, otherwise called *Mistura Fusca*, or Brown Mixture, under which name it is best known, and is extensively used to alleviate the distressing symptoms of cough.

Desirous of learning its origin, with the view of procuring a well authenticated formula, I sought in vain for some printed treatise that might elucidate the object of my search. Although prepared by nearly all our apothecaries, very little is known by them respecting its origin. The little information I have gathered in relation to its source, I owe to the politeness of Mr. FREDERICK BROWN, from whom I have obtained the following:

“Professor BENJAMIN SMITH BARTON, of the University of Pennsylvania, in the year 1814 or 15, wrote a prescription for a patient afflicted with cough,—and being pleased with its effect, requested CHARLES MARSHALL, Sr., of No. 56 Chesnut street, to keep it ready, and to his store the Doctor’s patients were always sent for it. The Doctor, wishing to call it by a name that would only be known to himself and the apothecary, after some difficulty, fixed upon the name of *Brown*, from its color. This mixture, it was said at the time, was the means of patients, afflicted with coughs, consulting the Doctor. He occasionally varied the quantity of antimonial wine to suit the case. After his death it was continued under the name of Barton’s Brown Mixture, until about the year 1822, when his name was dropped.”

It has ever since been much in vogue as a popular cough medicine, and now constitutes one of the regular, or, to speak more properly, one of the *irregular* preparations of the shop. Among the number of recipes which I have procured from different druggists, I scarcely found two to accord exactly

in their proportions and method of preparation. To exhibit the disparity that exists in preparation, I shall give the recipes that have been furnished me by six of our principal druggists.

No. 1.	No. 2.	No. 3.
Powdered Gum Arabic, 4 drachms,	4 drachms,	4 drachms.
Powd. Ext. of Liquorice, 4 "	4 "	4 "
Elixir Paregoric, 2 ounces,	2 ounces,	2 ounces.
Antimonial Wine, 1 "	1 "	1 "
Water, 14 "	12 "	Hot water, 14 "

The three above mentioned formulas emanated from the store of the said CHARLES MARSHALL, Sr., and are such as the three former assistants of Mr. M. now pursue in the preparation of their Brown Mixture, and are the only ones that have any claim to originality. The ingredients are the same in the three, but differ in a small degree from each other in the quantity and temperature of the water to be employed.

The three following differ more materially.

No. 4.

Powdered Gum Arabic	1 ounce.
Powd. Ext. of Liquorice	4 drachms.
Paregoric	1½ ounces.
Antimonial Wine	6 drachms.
Water	14 ounces.
Sugar	1 "

No. 5.

Powdered Gum Arabic	1 ounce.
Powd. Ext. of Liquorice	1 "
Paregoric	2 "
Antimonial Wine	1 "
Water	16 "
Sugar	2 "
Spirit of Nitre	4 drachms.

In preparing this mixture, the following directions are observed. Rub the gum, sugar, and liquorice together in a

mortar, and add the water, by small portions at a time, until the whole is dissolved: then add the paregoric, antimonial wine, and other ingredients, and shake the whole together.

No. 6.

Gum Arabic	4 drachms.
Extract of Liquorice	6 “
Paregoric	4 “
Antimonial Wine	2 “
Hot Water	12 ounces.

Dissolve the gum and liquorice in lumps, by means of the hot water; then throw upon a filter, and afterwards add the other ingredients to the filtered liquid.

Brown Mixture, as commonly made, may be considered a very inelegant preparation, and is subject to several objections in a pharmaceutical point of view. The principal of these are its extreme turbidness, aptitude to spoil, and want of uniformity. The powdered liquorice employed for this purpose is the liquorice of commerce, containing such impurities as starch, and insoluble carbonaceous matters independent of the copper with which it is invariably found contaminated. The design of recipe No. 6 is no doubt to get rid of these impurities by filtration: but this I found impracticable on account of the gum which fills up the pores of the paper, rendering it impervious. The solution of the extract alone is very difficult to filter: the liquid passes very slowly, leaving behind a large quantity of the liquorice undissolved. After the Brown Mixture has been suffered to remain at rest for some time, much of the liquorice, including the insoluble portion, is deposited, the proportion of gum not being sufficient to keep it in suspension, which has led to the custom of first shaking the bottle, before giving the mixture, which is then thick and turbid. If there be a considerable increase in the quantity of gum, the mixture sooner decomposes, and, to remedy this, some make a large addition to it of paregoric and antimonial wine, which, besides giving a greater anodyne effect than intended, throws down some of the gum and liquorice. During hot

weather it undergoes fermentation, under which circumstances it is required to be made in smaller quantities. Feeling the inconveniences of this, apart from the impolicy of offering to our customers a preparation of so ungainly an appearance as the ordinary Brown Mixture, we some time ago set about improving the formula, and as far as regards elegance of appearance, efficiency and permanency, no doubt is left upon our mind of having devised a vastly superior preparation. For this purpose we have brought to our aid the favorite system of displacement. In the desire of ascertaining the value of this principle, considered in relation to its means of furnishing an extract of greater purity than the commercial liquorice ball, made by decoction, we have had recourse to the experiments of Mr. GUILLERMOND, made upon this substance, through which we arrive at the following details:

Liquorice Root in coarse powder 330 parts.

Maceration and expression with 1560 parts of cold water gave 59 pts. ext.

Displacement	"	1200	"	"	"	"	98	"	"
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Maceration and displacement	"	1400	"	"	"	"	79	"	"
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Maceration and expression	"	720	"	alcohol 22°	"	"	37	"	"
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Displacement	"	600	"	"	"	"	37	"	"
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Maceration and displacement	"	680	"	"	"	"	38	"	"
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A glance at these experiments helped us to the immediate conclusion, that a highly concentrated and very limpid solution of all the soluble principles of liquorice root, as obtained by displacement, and embodying as it does a greater quantity of pure extract and *glycyrrhizine*, or the sweet principle of the root, to which it owes its demulcent properties, was far preferable to an imperfect solution of the common extract, containing impurities of various kinds to a considerable extent. The correctness of this judgment will be more readily conceded, upon viewing in connection with these experiments the analysis of this root.

According to Mr. ROBIQUET, liquorice root contains—1st, starch; 2d, albumen, coagulable by heat; 3d, woody fibre; 4th, phosphate and malate of lime and magnesia; 5th, a brown and thick resinous oil, to which liquorice owes its acidity; 6th a

peculiar uncrystallizable principle of a sugary taste, (glycyrrhizine,) soluble equally in water and alcohol, differing from sugar in not undergoing the alcoholic fermentation, and not producing oxalic with nitric acid; lastly, because it forms, with the acids, compounds, not very soluble in water.

From this it will be seen, that by treating liquorice root by displacement, we get all the soluble active principles of the root: and as it is alleged on high authority that the demulcent properties of the different kinds of extracts of liquorice are principally owing to the proportion of *glycyrrhizine* contained in them, consequently, the more of this substance in a pure state the solution may contain, the greater will be its efficacy. Again, by the cold water treatment, instead of boiling or using the extract made by decoction, we not only avoid the starch, but what is more desirable, we get rid of the oleo-resinous acrid principle, which is insoluble by itself in the cold water, and only dissolves along with the other principles, by heat, and then in proportion to its increase.

Having stated these preliminaries, it now remains to give the formula which we have adopted.

Take of finely bruised liquorice root,	.	.	.	1lb.
“ Powdered extract of liquorice,	.	.	.	℥j.
“ Water,	.	.	.	q. s.
“ Gum Arabic,	.	.	.	℥iv.
“ Paregoric Elixir,	.	.	.	℥j.
“ Antimonial Wine,	.	.	.	Oss.

Mix the liquorice powders together, with sufficient water to render the whole thoroughly moist; afterwards place them in a BOULLAY's filtering instrument, and operate by displacement with the remainder of the water, until you have obtained seven pints. Then take the gum arabic, in lumps, which you will dissolve in half a pint of the liquorice solution, and add it to the remainder, together with the paregoric and antimonial wine; lastly, shake, that the whole may be intimately mixed.

The above formula corresponds with the original, as far as regards the proportion of ingredients. According to the table, 330 parts of root gave 98 of extract, which, in the same ratio

would require $13\frac{1}{2}$ ounces to produce 4. But as we may suppose the quantity obtained by Mr. G. is the maximum product, and from liquorice of the best quality, and as that which we receive here is more or less old, and sometimes of impaired quality, we have lowered the standard so as to ensure an equal amount of extract from a greater quantity of substance.

The object of the liquorice extract mixed with the root is to impart the requisite degree of color.

The addition of the paregoric to the solution renders it slightly turbid at first, but it becomes clear soon after.

Brown mixture, thus prepared, is limpid, very sweet to the taste, of a deep reddish-brown color, and may be kept for an indefinite period without spoiling.

SELECTED ARTICLES.

ART. XLI.—ON THE RECTIFICATION OF ALCOHOL.

By M. SOUBEIRAN.

THE difficulties experienced in procuring large quantities of highly rectified alcohol, and the loss which accompanies the processes commonly employed, have induced me to undertake some researches upon these processes. I have obtained satisfactory results, by which science will be somewhat benefited; for, it is well known to what extent a higher or lower degree of rectification modifies the solvent properties of alcohol, and hence, many researches have been abandoned or have afforded no results, from the difficulty of obtaining easily and abundantly this liquid in a high state of concentration.

The rectification of alcohol of commerce, or of 86° , by simple distillation, without the assistance of any foreign substance, is the most common mode in use, in the laboratories of pharmacutists; and I can declare this to be the only method to which we can have recourse, when we wish to preserve the original sweetness of the alcohol; and it is this which should be employed in pharmaceutical preparations. This preference is not necessary when rectified alcohol is to be obtained for chemical operations.

It is known that Baumé, by successive distillations, and by dividing several times the products, could not obtain alcohol above 92.6° : which he called highly rectified alcohol.

Those substances destined for the rectification of alcohol, to be suitable for the purpose, should unite, to the condition of a strong affinity for water, that of not effecting any alteration in the alcohol. I first used the sulphate of soda, but with bad suc-

cess; only one trial was made, but that was not of a nature to afford any encouragement to continue. Three pounds of alcohol of 82.5° were put in contact with 500 grammes of effloresced sulphate of soda; the temperature was 9. c.: twenty-four hours after the alcohol marked 83.7° , I placed the mixture on a stove to facilitate the action; a temperature of 35° c. sustained for twenty-four hours, had raised the alcohol to 84.9° c. only; I then slowly distilled the alcohol from the salt, and obtained a product of 87.1 c.

Fused chloride of calcium, which is frequently used in France, readily raised the alcohol to an advanced point of rectification; but when we charge ourselves with the expense of the fire necessary for the fusion of a large quantity of the chloride, and beside consider the quantity of the product, we will quickly perceive the losses which result from the use of this salt; a result which is well known, and is confirmed completely by the following experiments:

I put 700 grammes of the fused chloride of calcium in 7 pounds of alcohol of 91° . When it was dissolved, I slowly distilled, and continued the operation as long as anything came over; I obtained $6\frac{1}{4}$ pounds of product, of 95.2° . The 7 pounds of alcohol of 91° contained 6.37 pounds of absolute alcohol; 6.25 pounds of 95.2° contain 5.93 pounds; consequently the loss was 0.42 of a pound.

The loss was much greater in the second experiment, in which a larger quantity of the chloride was used; to five pounds of alcohol at 86° , there were added 1.250 grammes of fused chloride; after twenty-four hours it was slowly distilled, and the distillation continued until no more passed over; the products separated, as they were distilled over, marked successively 95.6° , 95.6° , 95.6° , 95.6° , 95.6° , 95.6° , 95° , 95° , 94° , their mixture formed four pounds of alcohol, of 95° . Thus, for 4.30 pounds of absolute alcohol contained in the quantity acted upon, 3.80 pounds were procured in the product; 0.50 pounds remaining in chloride of lime.

The acetate of potassa possesses but slight advantages for the rectification of alcohol; I shall content myself with report-

ing the results of one experiment. I added one killogramme of fused acetate of potassa, to four pounds of alcohol, of 86° , and distilled slowly; so soon as the acetate was dissolved, on dividing the product, I obtained successively, alcohol of 92.5° , 93° , 93.5° , 93.5° , 93.5° , 93.5° , 93.5° , 93° , 93° , 93° , 93° , 93° , 93° , 92.75° , 92.75° , 92.50° , 92° , 90.5° , 72° , 43° . All the products when mixed, yielded an alcohol of 93° .

The use of quick-lime as an agent in rectification, has given the most advantageous results; it separates surprisingly the water from the alcohol, but it will be seen that it is far from sustaining all which it at first promised. I will begin by exhibiting three results, which show the action which alcohol and quick-lime, exercise upon each other.

1. On passing absolute alcohol upon quick-lime, heated to the temperature of 220 degrees, the alcohol underwent no change; the lime did not retain even a trace of it.

2d. If absolute alcohol be left with hydrate of lime, (Ca,Aq,) for several days, and the hydrate be then dried at the temperature of 35° or 40° , it does not retain the smallest quantity of alcohol.

3d. If absolute alcohol, be distilled with slacked lime (pure hydrate Ca,Aq,) the alcohol carries off a part of the water of the hydrate. In one experiment, 0.5 pound of absolute alcohol, distilled on a salt water bath, after forty-eight hours of contact with 324 grammes of hydrate of lime, furnished 0.49 pound at 93.6° .

In the rectification of alcohol by lime, it is always necessary to leave the two bodies in contact for one or two days, as it is only by degrees that the alcohol yields its water to the lime. The heat of a stove of 35° to 40° is very favorable.

One pound of alcohol of 93° was left for two days upon 220 grammes of quick-lime in powder; at the end of that time a small quantity of the alcohol, on being filtered, marked 95.8° . It was then distilled from the lime, and furnished 0.75 pound of alcohol, of 95.8° . The alcohol had, therefore, lost water, and the lime had retained water and alcohol.

A pound of alcohol, of 91° , was left in contact with 500

grammes of powdered quick-lime, for forty-eight hours; the alcohol marked then, previous to distillation, 95.9° . I then added to the mixture 500 grammes of quick-lime; twenty-four hours after, the whole was reduced to a thick paste. I separated a little of the alcohol by the filter; it marked 99.2° . I now repeated the experiments, only placing the whole of the lime at once in the alcohol. This was again raised to 99.2° . It results from these two experiments that the lime, when employed in sufficient quantities, can, in the cold, deprive the alcohol of nearly the whole of its water. If this paste of lime be placed in an alembic, upon a salt water bath, and distilled, then nearly the whole of the alcohol which passes over is absolute alcohol.

Five pounds of alcohol of 94.5° was left for three days, at the temperature of 15° c., with 2500 grammes of lime; the alcohol was filtered and marked 95.5 . The mixture was then placed in a stove, at the temperature of 35 to 40° , at the end of twenty-four hours, the alcohol marked 99.5° . It was left for twenty-four hours more in the stove, and the degree of the alcohol did not alter; then the mixture was slowly distilled on a salt water bath. The first portion of the alcohol which passed over, marked 99.5° . All which followed was absolute alcohol. Nevertheless, towards the termination of the operation, when the distillation appeared almost finished, the water being kept in the state of ebullition in the cucurbit, there passed a small portion of alcohol of which the degree was constantly lowering. The last liquor obtained marked only 97° . This result I have constantly noticed in rectifying alcohol by lime; the first portions which pass over contain traces of water; but this is soon replaced by absolute alcohol, which in its turn, towards the end of the operation, is succeeded by aqueous alcohol; from which it is evident that part of the hydrate of lime is decomposed.

In all the distillations of alcohol with lime, I experienced a loss of alcohol which was so great, when I wished to operate on considerable masses, that I soon deserted this mode. I think that this loss is owing to the heat being propagated with diffi-

culty to the middle of the mass of lime, which we are obliged to use. The experiments which I have related do not leave room for the belief that the alcohol combines with the hydrate of lime, of this I am fully convinced by the following experiment:

A pound of alcohol of 84° , which contained 0.800 pound of absolute alcohol, was put into an alembic with 500 grammes of finely powdered quick-lime, and then distilled by a salt water bath; the first portions marked 99.0° ; then the degree was elevated; I obtained absolute alcohol, and finally, towards the end of the operation, alcohol of a weaker grade. The water in the cucurbit was kept boiling for more than two hours after that the alcohol had ceased to come over more than drop by drop. All the products collected and united, weighed 94° . Their volume was 0.88 of a pound, which contained 0.827 of absolute alcohol.

I next employed carbonate of potassa, of which the use is recommended by some pharmacopœias, but of which the effects have been imperfectly studied.

I left, at a temperature of about 15° , 500 grammes of calcined carbonate of potassa, to act upon five pounds of alcohol of 86° . The carbonate of potassa slowly liquified. The alcohol, which at first had dissolved a portion of the alkali, deposited it as the rectification advanced. Distilled from the alkaline salt, it furnished alcohol of 94° .

Analogous experiments have afforded me similar results. The last experiment was made on 200 pounds of alcohol of 86° . I obtained nearly the whole of the alcohol of 93.3 . The last products marked 91° .

I was desirous of knowing how far the alkaline carbonate would carry the rectification. For this purpose, I used 225 grammes of carbonate of potassa, for a pound of alcohol of 86° . I obtained 94.6° . I used 200 grammes of the salt for a pound of alcohol already at 94.6° ; after many hours of contact, distillation furnished 94.8° ; the product returned to the same vessel and distilled anew marked 95.4 .

In another experiment, in which I employed 1.500 grammes of the salt, and three pounds of alcohol of 93.4° , the product

marked 94.7. Thus this limit of 94 to 95 appears to be impassable; at this point, the affinities of the alcohol and of the alkaline salt for the water, counterbalance each other. It is but step by step that the water is separated, and we can no longer hope for advantageous results from the use of the alkaline carbonate. It is to be remarked that, at this point, the alcohol is very near to the proportions of three atoms of alcohol and one of water, which constitutes alcohol of 95.1°.

However, the carbonate of potassa, is the most convenient agent which we can employ in the first rectification of alcohol; it brings it, without loss or difficulty, to 94 or 95°. The salt, after the operation, can be readily made useful; besides which, as it is scarcely soluble, it has not, like the caustic alkali, the disadvantage of altering the sweetness of the product.

Alcohol of 94° being obtained, how shall we deprive it entirely of the water which it contains?

100 grammes of fused chloride of calcium easily raises it to 97°, but with a considerable loss of alcohol; on adding to alcohol at 94°, 150 grammes of quick-lime to the pound, it will be raised, by remaining several days in a stove, to 97°. It is proper, in this case, to decant the alcohol, and not distil from the deposit, for it will then lose strength. The deposit may then be distilled alone, and will afford a feeble product.

Now, this alcohol of 97°, obtained by chloride of lime, or by quick-lime, being slowly distilled with 250 grammes of quick-lime to the pound, after two or three days of rest in the stove, will readily yield absolute alcohol.

I afterwards attempted to act with quick-lime directly upon the alcohol of 94°, obtained by the alkaline carbonate. The following first experiment is curious from its result:

Five pounds of alcohol of 94 were placed in a flask in a stove, with one killogramme of quick-lime, recently calcined and pulverized; the alcohol swimming over the lime at the end of two days, marked 99°.

The lime and alcohol were then distilled together slowly, and there was obtained successive portions of alcohol of 97.5°, 97.3°, 97.4°, 97.5°, 97.4°, 97.6°, 97.8°, 98.1°, 98.2°, 98.1°,

97.2°, 96.6°. Thus the alcohol has lost strength by distillation from the lime; it is the consequence of the fact which I before announced, that absolute alcohol became weaker by distillation from hydrate of lime. We observe this fact, wherever the lime is not in sufficient excess, one part of the hydrate of lime formed yields its water to the alcohol during distillation.

It is, therefore, necessary to use 500 grammes of lime to the pound of alcohol; and if the distillation be then slowly carried on, we readily obtain absolute alcohol. We may push the distillation as long as alcohol comes over; but the last portions are so long in passing that we would rather prefer, as soon as the alcohol ceases to flow in a stream, to add water to the lime, and draw off what remains as dilute alcohol.

To sum up, if we wish to obtain readily, abundantly, and economically, absolute alcohol, it is necessary to rectify first upon carbonate of potassa, then to rectify the alcohol which marks 94 to 95 by one of the two following methods:

1. To raise it to 97° by distillation with 100 grammes of fused chloride of calcium, or by letting it digest upon 150 grammes of quick-lime to the pound, and distilling anew and slowly with 250 grammes of quick-lime to the pound, after that the alcohol and lime have been in contact for two or three days in a warm place.

2. To add to the alcohol of 94°, 500 grammes of quick-lime to the pound; to leave them in contact for two or three days in a stove, and distil slowly. We will be much deceived if we suppose that the lime will communicate to the alcohol a disagreeable odor, or taste, as is stated in some works; this only happens when the alcohol upon which the lime is caused to act, has not been previously rectified; but after it has been submitted to rectification from the alkaline carbonate, this effect is not to be feared, and the alcohol which we obtain has all the qualities which we can desire.

Journ. de Pharm.

ART. XLII.—ON DIAPHORETIC ANTIMONY.*

By OSCAR FIGUIER.

THIS preparation is most generally known, in the shops, by the name of white oxide of antimony, and is extensively employed by practitioners. It is the compound which the French Codex, of 1818, designates by the name of *oxidum stibii album mediante nitro confectum*.

All pharmacologists are far from according in the mode of preparing this medicine, and one of the most unfortunate effects of this disagreement is, that the products obtained by the different methods do not present similarity in their composition and properties.

It results from the experiments of M. Berzelius, on this subject, that when a large excess of nitre is not employed, the product contains, in a state of mixture, differently oxydised compounds of antimony. M. Soubeiran has admitted that such is the composition of diaphoretic antimony, obtained by equal quantities of nitre and antimony, according to the Codex of 1818.†

* This paper is an extract from a monograph upon the substances designated under the name of white oxide of antimony, which obtained the gold medal of the Royal Society of Medicine, Surgery, and Pharmacy, of Toulouse.

† The following are the directions taken from the revised Codex of 1837.

SUPER ANTIMONIATE OF POTASSA.

(Antimonie Diaphoretique lavé.)

SUPER STIBIAS POTASSICUS.

R. Pure Antimony, (*Stibium purum*,) 1000Nitrate of Potassa, (*Nitras potassicus*,) 2000

Reduce each of these bodies to a fine powder, and mix intimately. Throw the mixture by small portions at a time into a crucible, previously heated to redness. When it is almost full, fit on the cover, and continue the heat for about half an hour. Then remove the contained pasty matter, allow it to cool, place it in a stoneware pan, and pour upon it a sufficient quantity of clear water. Allow the substance to break up of itself, then agitate with a wooden ladle, wash by decantation until the water no

Our experiments have led to the confirmation of this result. It is known how great is the difficulty of separating the different oxides of antimony; it is so great, that the most experienced analysts of our age regard it as almost insurmountable.

The following is the method we have followed in endeavoring to arrive at this end.

Diaphoretic antimony was treated several times in succession by acetic acid, at first weak, then more and more concentrated. This acid removed the potassa, and the protoxide of antimony; the latter was converted into an insoluble sulphuret, by means of sulphuretted hydrogen, and the quantity of sulphuret gave the proportion of oxide contained in the mixture.

To know the proportions of antimonious and antimonie acids, we dried the mixture of these two oxides, freed from the protoxide, at a temperature of 100° . The product thus dried, was introduced into a tube of green glass, provided with a leaf of copper, such as is employed for the elementary analysis of organic substances. To this was adapted a second tube, of dry chloride of calcium, as is practised in these analyses. Both tubes were exactly weighed. Heat was applied with caution, and continued at a dull red for an hour. The oxygen disengaged itself, with the water, at the commencement of the operation, but at its termination oxygen alone was disengaged. The heat was continued some time, until after bubbles ceased to form. The apparatus having been cooled, the two tubes were weighed. The increase in weight of that containing chloride of calcium, gave the quantity of water. The diminution in weight of the tube containing the oxides, indicated both the loss in water and oxygen. The quantity of water being known, it was easy to deduce the quantity of oxygen, which represented that which the antimonie acid had lost by its conversion into antimonious acid.

longer has a perceptible taste; finally throw the deposit upon a linen cloth, and dry by a stove.

Diaphoretic antimony should be of a perfect white color; it is composed of antimonie acid 87.75, potassa 12.25.

J. C.

These data are sufficient to establish the true constitution of the mixture.

We have practised this analytic method upon several specimens of diaphoretic antimony, obtained by different operations, where we have taken the greatest precaution to have the products identical: viz., equal proportions of the ingredients, the same vessel, the same continued heat, and in spite of these precautions we have obtained variable proportions of the different oxides.

The following table indicates to a hundredth nearly the respective quantities of oxides, acid, and water, which we have found contained in four equal weights of diaphoretic antimony prepared according to the Codex of 1818:

Oxide of Antimony	2.31	1.79	3.22	9.85
Antimonious Acid	8.31	9.36	7.39	13.21
Antimonic Acid	79.14	79.60	98.44	66.67
Water	10.24	9.25	10.95	10.27

Thus it is proved by us, that by following the Codex of 1818 to prepare diaphoretic antimony, it is almost impossible to obtain a product constantly identical; it is always a mixture, in variable proportions, of hypo-antimonite, of antimonite, and of bi-antimoniate of potassa, and of water. A few degrees of heat are influential in varying the relative proportions of these three compounds, which we have constantly found. We ought to state, however, that by maintaining the heat at the point of redness for an hour and a half, we have ascertained that the hypo-antimonite had completely disappeared.

Let us examine the product obtained by following exactly the directions given by the new Codex.

M. Guibourt, professor in the school of Pharmacy of Paris, has devoted himself to researches upon this subject; the results to which we have come, are nearly those published by that skilful observer, but they differ from them in some respects; thus, according to M. Guibourt, diaphoretic antimony, prepared according to the new Codex, is composed of

		Result obtained.	Result calculated.
Antimonic Acid	2 at	76.73	76.964
Potassa	1 "	10.97	10.744
Water	6 "	12.30	12.292

M. Guibourt does not admit that the diaphoretic antimony of the Codex can be a variable mixture of different oxides of this metal. The following experiments tend to show the opposite conclusion:

We treated by strong acetic acid the article of the Codex, prepared by following exactly the directions of that formulary. This acid dissolved a small quantity of the protoxide of antimony, which can easily be known, after its separation by means of the action of alkaline sulphurets, according to the observation of Berzelius.* The product, deprived by successive maceration with acetic acid of potassa and protoxide of antimony, was dried. We obtained 4.50 grammes. We placed them in a tube of green glass, to which was adapted a second tube, containing chloride of calcium equally weighed. The tube of green glass was maintained for an hour, at a dull red heat; it lost in weight 0.408 grammes. The tube of chloride of calcium was increased 0.228.

If we had had to make pure antimonic acid, the quantity of water would have nearly equalled the loss given by experiment; but the loss, in oxygen should have been 0.220, in fact, it was only 0.180. This difference arises necessarily, in consequence of a part of the product, supposed to be in the form of antimonic acid, being really in the state of antimoni-ous acid.

The above demonstrate that washed diaphoretic antimony, obtained with two parts of nitre, is a mixture of differently oxydized portions of antimony combined with water and potassa.

In order to obtain diaphoretic antimony, entirely formed of the antimoniate of potassa, it is necessary to take of metallic antimony, carefully purified by the process of Liebig, one part,

* Ann. Ch. et Phys. t. xx, p. 237.

nitrate of potassa, three parts, as directed by the Brunswick Dispensatory; the materials are reduced to powder, they are mixed exactly, and thrown by portions into a crucible, previously heated to redness. The matter is maintained at a red heat, during an hour and a half when cold; the product is thrown into four parts of water, decanted, and the liquid placed aside. The residue is three times to be boiled with the same quantity of water; the liquids are mixed, and the washing is finished by boiling water, which only removes the slightest traces of antimoniate. The product thus washed, is impure bi-antimoniate, but free from hypo-antimonite. If through the washing liquids a current of carbonic acid gas be passed, a very abundant precipitate is obtained, which is pure bi-antimoniate. As the carbonic acid can only separate a part of the potassa, the precipitate is necessarily formed of bi-antimoniate.

M. Berzelius remarks, that in the preparation of diaphoretic antimony, if the calcination be prolonged, the hypo-antimonite and the antimonite of potassa, are transformed into a neutral soluble antimoniate: the waters of washing, then, which are obtained, ought to furnish the greatest possible quantity of precipitate; which is the same as saying, that if we wish to employ the product of which we have spoken, it is necessary to prolong the calcination as much as possible, (during an hour and a half, or nearly,) to reject the insoluble product, after it has been well washed, and to preserve only the precipitate by the waters of washing, furnished by carbonic acid. The reiterated experiments which we have made upon this subject, have proved to us that, by this means, we can obtain more than three-fourths of the mixture employed.

If now we consider that heretofore the washings were rejected as valueless, it can be admitted that our method, independently of the goodness of the product, furnishes also a large enough quantity.

The antimoniate thus obtained is of perfect whiteness. We have analysed it by heating it to a red heat in a platina crucible, then by calcining another part in a tube, and receiving

the vapor of water in a tube with chloride of calcium, we have found the composition the same as that assigned to it by M. Guibourt.

We have tried to substitute for the carbonic acid the strong acetic acid, employed in very slight excess; the precipitate in this case has been antimonious acid, containing only some traces of antimoniate of potassa.

Journ. de Pharmacie.

ART. XLIII.—NOTICE OF THE ALCOHOLIC STRENGTH
OF WINES. By DR. CHRISTISON.

VARIOUS accounts have been given of the alcoholic strength of wines, by Brande, Julia-Fontenelle, and others. The author has been engaged for some time, in experiments for determining the proportion of alcohol, contained in various wines of commerce, and also, the circumstances which occasion a variety in this respect. The present paper, is an interim notice of the result.

The method of analysis consisted in the mode of distillation, which was applied with such contrivances for accuracy, that nearly the whole spirit and water were distilled over without the loss of more than between two and six grains in 2000. From the quantity and density of the spirit, the *weight* of absolute alcohol, of the density of 793.9, as well as the *volume* of proof spirit of the density of 920, was calculated from the tables of Richter, founded on those of Gilpin.

The author has been led to the general conclusion, that the alcoholic strength of many wines has been overrated by some experimentalists, and gives the following table as the result of the investigations he has hitherto conducted. The first column is the per centage of absolute alcohol, by weight, in the wine; the second, the per centage of proof spirit by volume.

	Alc. p. c. by weight.	P. Sp. p. c. by volume.
White Port,	14.97	31.31
Sherry, weakest,	13.98	30.84
Mean of thirteen wines, excluding those kept very long in cask,	15.37	33.59
Sherry, strongest,	16.17	35.12
Mean of nine wines very long kept in cask in the East Indies,	14.72	32.30
Madre da Xeres,	16.90	37.06
Madeira, { all long in cask } strongest,	14.09	30.80
{ in East Indies, } weakest,	16.90	36.81
Teneriffe, long in cask at Calcutta,	13.84	30.21
Cercial,	15.45	33.65
Dry Lisbon,	16.14	34.71
Shiraz,	12.95	28.30
Amontillad,	12.63	27.60
Claret, a first growth of 1811,	7.72	16.95
Chateau-Latour, first growth of 1825,	7.78	17.06
Rosan, second growth of 1825,	7.61	16.74
Ordinary Claret, a superior vin ordinaire,	8.99	18.96
Rives Altes,	9.31	22.35
Malmsey,	12.86	28.37
Rudesheimer, superior quality,	8.40	18.14
Rudesheimer, inferior quality,	6.90	15.19
Hambacher, superior quality,	7.35	16.15
Giles' Edinburg Ale before bottling,	5.70	12.60
The same Ale two years in bottle,	6.06	13.40
Superior London Porter four months bottled,	5.36	11.91

In addition to certain obvious conclusions which may be drawn from this table, the author stated, as the result of his experiments, that the alcoholic strength of various samples of the same kind, bears no relation whatever to their commercial value; and is often very different from what would be indicated by the taste of an experienced wine taster.

Some observations were next made on the effect produced on the alcoholic strength of wines, by certain modes of keep-

ing or ripening them, more especially by the method employed in the case of sherry, madeira, and such other wines, which consists of slow evaporation, for a series of years, through the cask, above, all in hot climates. The researches made by the author on this head are not complete; but he is inclined to infer from the experiments already made, that, for a moderate term of years, the proportion of alcohol increases in wine, but afterwards, on the contrary, diminishes; and that the period when the wine begins to lose its alcoholic strength is probably that at which it ceases to improve in flavor. The increase which takes place at first in the alcohol of wine undergoing evaporation through the cask, appeared at first view parallel to the fact generally admitted on the authority of Söemering, that spirit becomes stronger when confined in a bladder, or in a vessel covered with a bladder, in consequence of the water passing out by elective exosmose.

The author, however, on repeating the experiments of Söemering, as related by various writers, (for he could not obtain access to the original account of them,) was unable, by any variation of the process he could devise, to obtain the results indicated by the German anatomist. Constantly the spirit, whatsoever its strength, whether proof spirit or rectified spirit, became weaker. It was observed at the same time, that if the bladder containing spirit was enclosed in a confined space containing quick-lime, the spirit slowly became absolute alcohol of the density of 796, in consequence of a permanent atmosphere of alcohol being speedily formed, while the watery atmosphere was absorbed by the quick-lime as fast as it was produced. Subsequently it was proved that the bladder was not essential to the process; for an open cup of rectified spirit enclosed in a confined space with quick-lime, to absorb the water which arose from the spirit, became in two months absolute alcohol, of the density of 796. Professor Graham, of London, some time ago proved the analogous fact, that spirit might be thus rendered pure alcohol in the vacuum of an air pump. A vacuum, however, is, upon principle as well as fact, not necessary to the process; it merely accelerates it.

The new method is obviously applicable on the great scale for obtaining absolute alcohol, whenever time may be allowed.—*Proceedings of the Royal Soc. of Edin.—Lond. and Edin. Phil. Journ.*

ART. XLIV.—OBSERVATIONS ON ANTIMONY.

By H. CAPITAINE.

ANTIMONY fuses under a red heat, but is more or less fusible according to its purity. Chemically pure, as when extracted from tartar emetic, which is perfectly white and well crystallized, it is more fusible than the antimony of commerce, alloyed, as is well known, by different metals, and even than the antimony purified by the process of the Codex, or by that recommended of late by M. Liebig.

When antimony is heated by the blow-pipe on charcoal, it fuses into a perfect globule, which preserves, after cooling, a metallic brilliancy similar to that of silver. If the experiment be made with any of the three kinds of antimony cited above, a globule is obtained, which, after cooling, does not preserve its brilliancy in so perfect a manner. It has always a tarnished appearance; the globule from the antimony of commerce becoming completely black.

I may state here that the granular state, and the crystallization in small plates, which the Codex and many chemical works regard as a sign of the purity of antimony, constitutes a character of but little value; for we can cause antimony to assume either appearance, without undergoing any purification. It is only necessary for this, to fuse the metal and cause it to cool suddenly, or with slowness. When the cooling is very prompt, the antimony has a granular texture; when it takes place more slowly, it crystallizes in small plates. That pure antimony commonly exhibits a granular texture, or small plates, is solely due to the circumstance that we always ope-

rate on small quantities, and the metal cools too rapidly to assume the texture of large plates, such as the antimony of commerce presents.

Antimony entirely devoid of arsenic, when thrown on incandescent coals, gives off vapors which are entirely without odor. However small may be the alloy of arsenic, the vapor still assumes the alliaceous odor. This method is perhaps the most delicate for recognising the presence of arsenic in antimony. The process proposed by M. Serullas, and adopted by the authors of the new Codex, is likewise of great sensibility; but the process of Marsh, which is so sensible when searching for arsenic in a free state, or in combination with oxygen, is totally insensible when the object is to detect arsenic in metallic antimony.

In fact, if we introduce into the apparatus of Marsh, antimony of commerce containing arsenic, and giving rise to a strong alliaceous odor on burning coals, dull black metallic spots will be obtained, which, although they may contain more arsenic than the antimony from which they were derived, will react with agents absolutely as if entirely of pure antimony. Formed on plate of porcelain, and treated by one or two drops of nitric acid, they furnish, after the excess of acid has been driven off by heat, a residue which, touched by nitrate of silver, produces no red color which indicates the presence of arsenic; but if, after treatment with the nitrate of silver, we add to the residue a drop of ammonia, in an instant there is formed a beautiful black color, which M. Orfila states to be a character peculiar to antimony, and very suitable to distinguish it from arsenic.

Thus the arsenic which exists in the spots which are obtained by placing in the apparatus of Marsh, arsenical antimony, is concealed, and is not to be detected by those means which are useful when it is isolated. This is owing to the circumstance, that when arsenical antimony is treated by nitric acid, the arsenious or arsenic acid which is formed by the oxidation of the arsenic, does not remain in a free state; it combines with the antimonious acid, and is thus withdrawn

from the influence of the reagents. The quantity of arsenic which may be thus hidden in the antimony, without its existence being suspected or discovered, except by the means which I shall point out, is considerable. Antimony which I had alloyed with $\frac{1}{36}$ of arsenic acted like the antimony of commerce, notwithstanding which the product from the action of nitric acid, when thrown upon burning coals, gave out a strong alliaceous odor.

Antimony may combine with hydrogen, but I have never been able to produce this compound except mixed with considerable free hydrogen gas.

Antimoniuretted hydrogen has no odor, in which it differs from arseniuretted hydrogen; it is besides remarkable for the facility with which it is decomposed; under an elevation of temperature it is separated into its simple elements and this much before the temperature is carried to a red heat.

Arsenic, especially when it finds nascent hydrogen, unites with it, and produces arseniuretted hydrogen. It is not the same with antimony: an alloy of potassium and antimony, thrown upon water, yields perfectly pure hydrogen; but should the alloy contain even traces of arsenic, the gas will have the characteristic odor of arseniuretted hydrogen, and will deposit a black coating when burnt in a narrow tube.

That antimoniuretted hydrogen should be produced, it is necessary to place in water, strongly acidulated with sulphuric acid, an alloy of antimony and zinc. The disengaged gas contains antimoniuretted hydrogen, together with much free hydrogen. An alloy of two parts of zinc and one part of antimony is that which furnishes a product the least mixed with free hydrogen, especially if a quantity of oxide of antimony be added to the liquid. When an alloy of one part of zinc and one of antimony is used, the action is very slow, and the gas disengaged is hydrogen nearly pure.

The combinations of antimony and oxygen have not the absolute insolubility in oxygen which is usually attributed to them. I have ascertained that oxide of antimony, antimonious

and antimonie acids, are slightly soluble in water, more especially at the boiling temperature.

The solution of oxide of antimony does not deposit any thing on cooling. It reacts with sulphuretted hydrogen absolutely, like a feeble solution of arsenious acid; it becomes of a clear yellow color, and if ammonia be then added, the color disappears, the solution being entirely colorless. The sulphuret of antimony formed in this instance, dissolves in the ammonia with the same facility as the sulphuret of arsenic. When I first noticed this property, I suspected it to happen from having used antimony containing arsenious acid, although I had used the process, recommended by M. Liebig, to obtain the purified antimony which I had employed. But having boiled the residual oxide in several successive portions of water, I obtained, each time, a liquid which produced, with sulphuretted hydrogen, a yellow color of similar intensity.

The constant reproduction of this color, sufficed to attribute it to the oxide of antimony, and not to arsenious acid. I nevertheless repeated the experiment with pure oxide of antimony, extracted from tartar emetic, and of the purity of which I could have no doubt; the same appearances were reproduced. There is, therefore, an identity in the manner in which a weak solution of arsenious acid, and a solution of oxide of antimony react, when treated by sulphuretted hydrogen and ammonia; but, although similar in certain characters, they differ much in others. While that of the solution of arsenious acid, in the apparatus of Marsh, gives brilliant metallic spots, the solution of oxide of antimony, submitted to the same test, furnishes black, tarnished spots, offering all the characters of antimony.

The yellow liquid, obtained by causing sulphuretted hydrogen to act upon a weak solution of arsenious acid, left to itself, deposits a canary-yellow powder, (sulphuret of arsenic;) the yellow liquid, from oxide of antimony, will deposit, by the next day, orange-yellow flocculi, easily recognised as sulphuret of antimony. The sulphuret of antimony is separated, imme-

diately, from the solution by the addition of concentrated hydrochloric acid, especially when boiling.

Antimonious acid is more soluble in water than the oxide; the filtered boiling liquor becomes cloudy on cooling; it is colored yellow by sulphuretted hydrogen, and is deprived of its color by ammonia, as entirely as the solution of the oxide.

When antimonious acid is heated with iodide of potassium in a tube, closed at one end, abundant vapors of iodine are disengaged, and the residue is an hypo-antimonite of potassa. The temperature need not be much increased to produce this effect.

The antimonie acid has also a slight solubility in water, and its solution acts with sulphuretted hydrogen and ammonia in the same way as the oxide of antimony and antimonious acid.

The hydrated sulphuret of antimony, which is formed by the action of sulphuretted hydrogen on protoxide of antimony dissolved in water, exhibits, both while in suspension and solution, the clear yellow color of sulphuret of arsenic; besides, like the former, it is soluble in ammonia; whether this be added to the clear and transparent liquor, or to the sulphuret itself when deposited as orange yellow floculi.

I am satisfied that the sulphuret of antimony is really dissolved in the ammonia itself, and not in the sulphuret of this base, which is produced by its addition to a liquid containing more sulphuretted hydrogen than is necessary for the decomposition of the oxide of antimony. For when we add to the solution of oxide two or three drops of water of sulphuretted hydrogen, certainly not sufficient to destroy all the oxide, the yellow color will be discharged by ammonia, the same as if the liquid had contained an excess of sulphuretted hydrogen. Besides, if, after having decomposed the oxide by a slight excess of the sulphuretted hydrogen, the solution be then boiled for a short time, the orange yellow sulphuret, which is deposited, is, when separated from supernatant liquid, completely soluble in ammonia.

The sulphuret of antimony, formed by the action of sulphuretted hydrogen on oxide of antimony, possesses, like the

sulphuret of arsenic, an unequivocal solubility in ammonia. It is the same with the sulphuret of antimony obtained by the action of sulphuretted hydrogen on oxide of antimony, in combination; but here the solubility is not so great as appearances would lead us to believe.

When a small quantity of sulphuretted hydrogen water is added to a solution of tartar emetic, a yellow color is produced which ammonia will not discharge. If a large quantity of the sulphuretted hydrogen be added, an orange colored precipitate is formed, and readily deposited as long as the sulphuretted hydrogen is not in excess; but, if the addition be continued, the greater part of the sulphuret of antimony will be very slowly deposited and remain as if in suspension in the liquid. If the ammonia be added to the supernatant liquor, it will instantaneously render it clear and transparent; but here it is not the ammonia alone which dissolves the sulphuret, but it is the hydrosulphuret of ammonia, resulting from the union of the ammonia with the excess of the sulphuretted hydrogen.

If the sulphuretted hydrogen, which is deposited, be washed several times in water, and then placed in ammonia, it dissolves in a notable quantity. The ammonia does not change color, but when exposed to the air, or saturated by an acid, it deposits the sulphuret which it held in solution.

The bi-sulphuret is soluble in ammonia, and the solution is yellow.

The per-sulphuret dissolves largely in ammonia, and the solution is likewise yellow. Exposed to heat it is decomposed into sulphur, and sulphuret of antimony. We do not know whether this sulphuret should be considered as a particular combination, or whether it is a mixture of sulphur with bi-sulphuret of antimony.

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ART. XLV.—ON THE HYPOCHLORITES. BY M. E. MILLON.

(Extract.)

It is generally admitted that the decolorizing compounds, produced by the direct action of chlorine on the alkalies, are mixtures of metallic chlorides and salts, formed by a particular acid, the hypochlorous acid. "This hypothesis," says M. Millon, "appears to be entirely established by the discovery made by M. Balard, of the existence of a peculiar compound of chlorine and oxygen, formed of a single equivalent of each element; but, on examining the action of these supposed mixtures of chlorine and hypochlorites upon salts of a lower grade, we discover a series of new facts, which are inexplicable by the theory of the hypochlorites, and which leads to a new and unexpected mode of viewing the bleaching compounds.

"If a recent solution of chloride of lime be caused to act upon a solution of nitrate of lead, a precipitate is obtained, which is at first white, but soon becomes yellow, and, by gradually deepening its shades, changes to a brown. The supernatant liquor contains nothing but nitrate of lime. The white precipitate has been considered as a chloride of lead, which, by a subsequent decomposition of the hypochlorite, is converted into peroxide of lead; but if this white precipitate be separated immediately after its formation, there will be no difficulty in discerning that it does not possess the properties of chloride of lead. It continues to become colored, notwithstanding the absence of the hypochlorite of lime, at a slightly elevated temperature, and analysis demonstrates that the precipitate, in its white and brown state, are isomeric conditions of the same body, of which the formula is PbOCl . It is a compound which corresponds to the peroxide of lead, and in which the oxygen, which constitutes this latter a peroxide, is replaced by an equivalent of chlorine. This same compound is likewise formed whenever a current of dry chlorine is caused to pass upon litharge, obtained by calcining carbonate of lead. On substituting the protonitrate of iron for the ni-

trate of lead, there is thrown down a brown substance, having all the exterior properties of peroxide of iron, but which is represented by the formula $\text{Fe}^2\text{O}^2\text{Cl}$; it is again the peroxide in which all the oxygen constituting the higher degree of oxydizement is replaced by its equivalent of chlorine. With the protosalts of manganese an analogous precipitate is produced, but the quantity of chlorine is doubled. If the persalts of iron and manganese be employed, instead of the protosalts, a subsalt is deposited, and chlorine is disengaged in abundance. With the salts of deutoxide of copper the phenomena take place differently. A compound is formed, and which decomposes almost immediately at common temperatures, and liberates pure oxygen. At the same time that the oxygen is disengaged, an oxychloride of copper is deposited, of which the formula is Cu^2OCl , and which thus corresponds to the deutoxide. The same compound is formed directly, by passing dry chlorine upon protoxide of copper, slightly heated by the flame of an alcohol lamp."

"It is very easy," says M. Millon, "to generalise these facts, and consider the bleaching compounds, formed by the alkalies, as compounds corresponding to the peroxides, but in which an equivalent amount of chlorine has been substituted for that portion of the oxygen which constitutes the peroxide. Then in these two orders of compounds, an analogy in composition would lead to an analogy in properties; the same want of permanency, the same oxydizing power, the same decolorising action, for the alkaline peroxides exhibit great energy in bleaching.

"This new theory should find its verification in the comparative composition of the bleaching compounds of soda and potassa. The two peroxides of these bases have a very different composition. That of potassium is KO^3 , that of sodium, which is not given by Thenard, but is represented in the tables of Berzelius, by Na^2O^3 . It results from these two formulas that the bleaching compound of potassa should contain four times as much chlorine as that of soda.

$\text{K}\text{aO} + \text{O}^2$ peroxide of potassium corresponds to $\text{K}\text{aO} + \text{Cl}^2$.

$\text{Na}^2\text{O}^2 + \text{O}$ peroxide of sodium corresponds to $\text{Na}^2\text{O}^2 + \text{Cl}$.

"Experience proves that potassa absorbs a quantity of chlorine double that which soda absorbs. Potassa should absorb four times as much; there is then an error in the theory or in the formula assigned to the peroxide of sodium. An analysis of this latter was then made, and it was, in fact, found that in the formula adopted, the oxygen had been stated too low, that the sodium united with two atoms of oxygen in place of one and a half, to become peroxide, and should be represented by NaO^2 . The potassa compound ought then, as is proved by experiment, to have double the decolorizing power of that of soda. The theory thus is found to be confirmed.

"The bleaching compounds," pursues the author, "do not then constitute salts, but rather combinations corresponding to the peroxides, in which all the oxygen, which is added to the protoxide to form a higher oxide, is replaced by its equivalent of chlorine, and, by a singular turn of theory, the compounds, considered as mixtures of chlorides and hypochlorites, are really simple compounds; while the hypochlorites, considered as simple salts, and without mixture, are mixtures of peroxides and peculiar bodies corresponding to peroxides.

"It is natural to presume that bromine, iodine, sulphur, and, perhaps, other metalloids, form analogous compounds, and on the other hand, that compounds of that nature which are formed by chlorine, and correspond to the higher oxides not suitable to form salts, as the peroxides of lead and bismuth, give rise, with hydrochloric acid, when the reaction takes place under the influence of a freezing mixture, to a new bleaching compound, formed of chlorine and hydrogen, which contains twice as much chlorine as hydrochloric acid. It is a bichloride of hydrogen, which, in the series of combinations of chlorine, is altogether analogous to the peroxide of hydrogen. Oxygenated water, therefore, promised to become the type of numerous and parallel series which will expand considerably the field of mineral chemistry, without introducing any complication.

P. A. C.

Journ. de Pharm.

ART. XLVI.—ON CINCHONA. Extracted from the Lectures of

JOHN PEREIRA, Esq., F. L. S.

Published in the London Medical Gazette.

(Concluded)

(a.) *Pale Barks (Cinchona pallida.)*1. *Crown or Loxa Bark.*

History and synonymes.—A bark called *Loxa bark* has been long known in Europe, and was perhaps one of the first introduced into this quarter of the world. In all probability it was the bark which Horbius, in 1693, denominated *Cascarilla della Oja*, but which Condamine more correctly terms *Corteza*, or *Cascara de Loxa*. It is admitted, I believe, by all botanists, that this bark was procured from the *Cinchona condaminea*; but some doubt exists in the minds of pharmacologists whether this is the bark now known in commerce by the name of *Loxa bark*. Hayne has pointed out some differences between the *Loxa bark* of commerce and a bark found in Humboldt's collection, marked *Quina de Loxa*, and which had been collected from the *C. condaminea*: the peculiar characteristics of the latter are the warty prominences, the transverse cracks, which do not form rings, the browner tint of the outer surface, and a more astringent taste. A representation of this kind of bark is given in Goebel and Kunze's "*Pharmaceutische Waarenkunde*:" and the first of these authors tells us, that in a chest of 120 pounds of commercial *Loxa bark*, he could only find three ounces corresponding to this true *Loxa bark*. Bergen does not admit the opinion of its being a distinct kind.

Loxa bark received the name of *Crown bark (Cinchona corona seu coronalis)* in consequence of its use by the royal family of Spain. The following anecdote will serve to illustrate this point:—In October, 1804, a Spanish galley, returning from Peru, was taken by our countrymen off Cadiz. Among the treasures found therein were many parcels of *Cinchona bark*, two sorts of which were distinguished from

the others by their external appearance and mode of packing. Two of these chests were marked "*Para la real familie*," (for the royal family,) and were lined with sheet iron: they contained fine quills, of thirteen inches long, tied up by means of *bass* into bundles of about three inches in diameter. Von Bergen states that he received from England, in 1824, similar bundles, under the name of *second Crown*. The other sort was marked "*Para la real corte*," (for the royal court.)

Commerce.—Crown or Loxa bark is imported in serons (holding from sixty to ninety pounds,) and in chests (containing about one hundred pounds.) In these packages we sometimes meet with bundles tied round with *bass*. A bundle which I have is fourteen inches long, and six inches in diameter.

Varieties.—Druggists make several varieties of Crown bark, but none of them of much importance: they are founded partly on the thickness and size of the quills, and the nature of the epidermis,—partly on the crustaceous lichens. Thus the finest and thinnest quills, with a short fracture, constitute what is called *Cort. Cinchonæ coronæ superf. elect.* A somewhat larger quill, with a silvery appearance of the epidermis, derived from the adherent crustaceous lichens, constitutes the *Silver Crown bark*. A similar kind of bark, but in which the external coat has a speckled appearance, is called *Leopard Crown bark*. Lastly, a rusty colored variety, remarkably free from lichens, and which I believe to be the young Huamalies bark, is sold as *Rusty Crown bark*.

Characters.—Loxa or Crown bark is only met with in the form of coated quills; neither flat nor uncoated pieces being ever met with. These quills vary in length from six to fifteen inches; in diameter from two lines to an inch; in thickness from one-third of a line to two lines: they are both singly and doubly quilled. The outer surface or epidermis of this bark is characterized by numerous transverse cracks, which in the fine and middling quills are often distant from each other only from one to one and a half lines, and frequently extend

completely around the bark in the form of rings, the edges of which, as well as of the shorter cracks, are a little elevated. In some of the fine quills, however, these transverse cracks are hardly visible; but we then observe longitudinal furrows. On the larger quills the transverse cracks are interrupted, and do not form rings, and are not set so closely together. Some of the thicker quills have occasionally almost the roughness of a grater; and occasionally pieces are met with having knots or warts. The color of the external surface of Crown bark depends principally on that of the crustaceous lichens. Gray, or grayish brown, may be taken as the predominating tint: the thin quills are mostly slate, ash, or roe gray. The larger quills vary still more, and, in addition to the colors now mentioned, they are sometimes blackish gray,—even passing, in places, into liver brown. The inner surface of Loxa bark is smooth with small irregular longitudinal fibres observed thereon: its general color is cinnamon brown. The transverse fracture of small quills is even, but of the larger and and coarser ones, fibrous. The powder of Loxa bark is of a deep cinnamon brown color. The odour of this bark is like that of tan; its taste astringent, bitter, and somewhat aromatic.

Botanical history.—*Cascarilla fina de Uritusinga*, or genuine Loxa bark, is admitted by most writers to be obtained from the *Cinchona condensinae*. It has, however, been supposed that this tree, which is said to be comparatively scarce, could not yield all the Loxa bark of commerce; and hence the latter has been referred to some other species, and the *C. scrobiculata* has been usually fixed on, in consequence of a remark made by Humboldt, that the young barks of these two species are hardly distinguishable in commerce. Various arguments, however, are advanced by Bergen against this notion, and he declares himself in favor of the *C. condensinae*, as the mother plant of Loxa bark. One fact he adduces deserves especial attention: the lower part of the branch of the *C. condensinae*, represented in the tenth plate of the first volume of the "*Plantes Equinoxiales*," actually presents

the same numerous transverse annular cracks already described as belonging to the Loxa bark of commerce.

Chemical properties.—We have two analyses of this kind of bark: one by Pelletier and Caventou, the other by Bucholz. In sixteen ounces of commercial Loxa bark, the last mentioned writer found the following soluble constituents:—

	Drs.	Grs.
Fatty matter, with chlorophylle	1	0
Bitter soft resin	2	0
Hard resin (red insoluble coloring matter)	12	0
Tannin, with some minims of acetic acid	3	0
Cinchonia	0	28
Kinic acid	1	30
Hard resin, with phyteumacolla	1	47
Tannin, with chloride of calcium	4	25
Gum	5	40
Kinate of lime	1	40
Amylum, a small quantity.		

But, though quinia is not here mentioned, there is no doubt but that it exists in this kind of bark, though in small quantity. Von Santen gives the following quantities of sulphate of quinia obtained from 100 lbs. of Loxa bark:—

	Ounces.
Thin selected quills	1.042
Moderately thick pieces	4.444
Selected thick heavy pieces, with grater-like bark	11.104

2. *Silver or Gray Cinchona.*

History and synonymes.—This bark was first carried to Santander, in Spain, in the year 1799, by the frigate La Veloz. It is known in this country by the name of *Silver* or *gray Cinchona*; in France by that of *Lima bark*; in Germany by that of *Huanuco*, *Yuanuco*, or *Guanuco bark*.

Commerce.—It is imported usually in chests containing about 150 pounds, and also, though less frequently, in serons of from 80 to 100 pounds.

Characters.—It always occurs in the form of quills, no flat pieces being known. These quills are larger and coarser than those of Crown bark: the largest even approximate to those of Yellow bark, from which they are distinguished by the greater smoothness of their external surface. The length of the quills is from three to fifteen inches; their diameter from two lines to one and a quarter, or even two inches; their thickness one-third of a line to five lines. We observe on the epidermis transverse cracks, but they do not form rings, as in the Loxa or Crown bark. On the thicker quills longitudinal furrows are observed; and in these cases the transverse cracks are frequently wanting. The color of the epidermis is whitish: in the smaller quills it is a uniform whitish gray, while in the large quills we observe a kind of cretaceous covering. This whitish appearance, from which, indeed, the terms silver and gray given to this bark are derived, depends on some crustaceous lichens, as I have already observed. The structure of the inner surface of this kind of bark is, in the small quills, smooth; in the larger ones, fibrous: the color is rather reddish, or rusty brown, than cinnamon brown. The fracture is even, and resinous; the odor clayish or sweet, and which Bergen says is peculiar to this kind. The taste is astringent, aromatic, and bitter; the powder of a deep cinnamon brown.

Botanical history.—The tree yielding this bark is unknown.

Chemical history.—I am not acquainted with any analyses of this bark, though several chemists have examined it with the view of determining the nature and proportion of its active principles. The following are their results:

Quantity in a pound of Bark.

		Cinchonia.	Quinia.
Von Santen	from 106½ to 210 grains
Michaelis	} finest quality	50	32 grains
	} another sample	74	28
Goebel and Kirst	168

Ash Cinchona Bark.

History and synonymes.—It is uncertain at what period this bark was introduced into commerce, but it was probably among the earliest varieties introduced. Bergen states he found it in an old collection of drugs made in 1770. It has long been known in English and German commerce, but was unknown to the French until I sent samples to Professor Guibourt, who, in the last edition of his "*Histoire Abrégée des Drogues*," speaks of it as a variety of Loxa bark: in this I think he is in error, for it does not appear to me to possess the characteristic marks of Loxa bark.

In Germany it is called *Jaen Cinchona*, after a province in South America of that name. The term Jaen has become corrupted into *Ten*, by which name this bark is designated; or to distinguish it from the pseudo-Loxa bark, also called by this name, it is termed *pale ten cinchona*.

Commerce.—It is imported usually in chests of from 110 to 140 lbs.; but we meet with it also in serons of from 70 to 100 lbs.

Characters.—This bark is met with in a quilled form only: the quills being of middling size, or somewhat thick; being from 4 to 16 inches long, from $3\frac{1}{2}$ lines to 1 inch diameter, and from $\frac{1}{2}$ to 2 lines thick. A very remarkable character connected with this bark is the crookedness of the quills, which are more or less arched and twisted; from which circumstance we may infer the probability of its being obtained from a tree which grows in a damp situation. On the outer or epidermoid surface we observe a few transverse cracks, and some faint longitudinal cracks; but in these respects there is a manifest difference between this and Loxa bark. The color of the outer surface varies between ash gray, whitish gray, and pale yellow, with blackish or brownish spots. The inner surface is either even or splintery, and of a cinnamon brown color. The fracture is even or splintery; the odor is tan-like; the taste feebly astringent and bitter. The color of the powder cinnamon brown.

Botanical history.—According to Bergen, the Ash bark is identical with the *Cascarillo palido* of Ruiz, which is obtained from the *Cinchona ovata* of the Flora Peruviana, and which is the *C. pubescens* of Vahl.

Chemical history.—No distinct analysis of this bark has been made. Here are the results of some experiments made to determine the proportion of active principle:—

Quantity of Active Principle in a Pound of the Bark.

		Quinia.	Cinchonia.
Michaelis	{ 1st sort . .	44 grs.	12 grs.
	{ 2d sort . .	80 grs.	12 grs.
Goebel and Kirst	. .	12 grs.	none.

Dark Ash Bark, — False Loxa, — Dark Ten Cinchona
Under the name of *China Pseudo Loxa*, or "*Dunkele Ten-China*," Bergen has described a bark which has many of the properties of Ash bark, and which is found mixed with the Loxa bark of commerce. It is principally distinguished from the Ash bark by the irregular longitudinal wrinkles and transverse cracks, and by its darker color. Guibourt regards it as an inferior kind of Loxa bark. Batka regarded it as a species of Buena; but Bergen says it agrees with a bark in the collection of Ruiz, said to be obtained from the *C. lancifolia* of Mutis.

(b.) *Yellow Barks (Cinchona flava.)*

4. *Yellow Bark of English Commerce.*

History and synonymes.—Dr. Relph tells us, that in a letter received from a Spanish merchant at Cadiz, in September, 1789, it is stated that the yellow bark had been lately known there, and that the first parcel which arrived was tried at Madrid, and immediately brought by the king's order, for his own use. From this circumstance, it was distinguished by the name of *royal yellow bark*, and on the continent it is still known by this appellation. The Germans call it *Königs-China*, or *China regia*; the French, *Quinquina jaune royal*. There is another name by which it is frequently known—

Calisaya bark (*Quinquina Calisaya* of Guibourt;) and which Humboldt says is derived from a province of that name in South Peru, in which the tree yielding this bark grows. In English commerce it is known merely by the name of *yellow bark*, an appellation rather unfortunate, as we shall presently find, since the same term is applied on the continent to another variety—the Carthagena bark.

Commerce.—It is imported in serons and chests.

Varieties and characters.—In commerce, two varieties of yellow bark are met with—namely, the *quilled* and the *flat*. The finest quills are selected for filling the show bottles in druggists' windows; and in some of the shops at the west end of London very fine samples are seen.

(a.) *Quilled yellow bark* (*Cinchona regia tubulata seu convoluta*.)—The quills vary in length from 3 to 18 inches,—in diameter, from 2 lines to $1\frac{1}{2}$ or even 2 inches,—in thickness, from $\frac{1}{2}$ to 6 or 7 lines. Very small quills, however, are rare; those usually met with having a diameter of from 1 to $1\frac{1}{2}$ inches, and a thickness of from 3 to 6 lines. Sometimes they are doubly, though in general they are singly quilled. The quills are in general coated.* On their external surface they are marked by longitudinal wrinkles and furrows, and predominating transverse cracks, which often form complete circles around the quills, and whose edges are usually raised. These furrows and cracks give a very rough character to this kind of bark, by which, indeed, it may be readily distinguished from the large quills of the gray or Huanuco bark. The color of the epidermis is more or less light gray; in those spots where the epidermis is wanting, the outer surface of the bark is of a brown color. In other characters the quilled and flat pieces agree.

(b.) *Flat yellow bark* (*Cinchona regia plana*.) The pieces of this variety are from 8 to 15 even or 18 inches long,—from 1 to 3 inches broad—from 1 to 5 lines thick. They are but little curved or arched. In general the pieces are uncoated (*China regia nuda*.) Sometimes the uncoated pieces are found by drying to have become convex on the inner, and concave on

the outer side. When the coating is present, it agrees in characters with the coated quilled yellow bark already described, in having wrinkles, furrows, and transverse cracks, and in the color of the epidermis.

The inner surface of both quilled and flat pieces is even and often almost smooth. On examination, it is seen to consist of fine closely set longitudinal fibres. Its color is cinnamon brown; the same color is also perceived on the outer side of the bark in the places where the coating is removed.

Botanical history.—It is, I think, still uncertain what tree yields the yellow bark of English commerce. It is stated by Mutis, that the *Cinchona cordifolia* yields the *Quina amarilla*, or yellow bark; and hence, in the Pharmacopœia and other works, our yellow bark is stated to be the produce of *C. cordifolia*; but this is an error, arising from the circumstance of the term yellow bark (*China flava*) being applied on the continent to that which we call Carthagena bark; and Guibourt tells us that the authentic specimens of the yellow bark of Mutis, brought by Humbolt, are, in fact, specimens of Carthagena, and not of Calisaya bark.

Mutis states, that the *Quina naranjada* (orange Cinchona bark,) is obtained from the *C. lancifolia*; and as many persons regard the orange bark of Mutis as synonymous with the Calisaya, or yellow bark of English commerce, we find that several writers attribute the latter bark to the *C. lancifolia*. Notwithstanding the authority of the persons who have espoused this opinion, I cannot admit it, since both Bergen and Guibourt declare Calisaya bark is not the orange bark of Mutis. The former examined the *Quina naranjada* (*C. lancifolia* of Mutis) in Ruiz's collection; the latter the *Quinquina orangé de Mutis*, in the *Muséum d'Histoire Naturelle* at Paris.

Chemical composition.—Pelletier and Caventou have published the following as the constituents of Calisaya, or yellow bark:—

Superkinate of quinia.

Fatty matter.

Slightly soluble red coloring matter (*red cinchonic.*)

Soluble red coloring matter (*tannin.*)

Yellow coloring matter.

Kinate of lime.

Lignin.

Amidine.

Subsequently to this analysis, cinchonia has been discovered in this bark.

The quantity of quinia and cinchonia contained in this bark has been examined by several chemists. The following are two sets of results, which, unfortunately, are discordant:—

MICHAELIS.

Quantity of Quinia in a pound of Bark.

Quilled yellow bark	154 grs.
Flat uncoated yellow bark	286

GOEBEL AND KIRST.

Thin quills	60
Thick quills and coated flat pieces	84
Uncoated flat pieces	95

When I speak of sulphate of quinia, I shall enter more fully into this subject.

(c.) *Red Bark (Cinchona ruba.)*

5. *Red Cinchona Bark of Commerce.*

History and synonymes.—Dr. Fothergill, in a letter to Dr. Saunders, states, that in the year 1702, a parcel of bark was taken on board a Spanish vessel, and a portion of it fell into the hands of a celebrated London apothecary, Mr. D. Pearson. According to Dr. Fothergill, it was the red bark. In 1779, another Spanish ship, bound from Lima to Cadiz, was taken by an English frigate, and carried into Lisbon. Her cargo consisted principally of red bark, and was for the most part sent to Ostend, where it was purchased at a very low price by some London druggists, who, after some difficulty, contrived to get it introduced into practice. Such are the circumstances

attending the first introduction of red bark into English, or I may say into European, practice. It deserves, however, to be noticed, that some South American travellers had already alluded to a red bark, (*Cascarilla colorada*,) though it is uncertain whether they referred to this variety.

The *red bark* of English commerce is synonymous with the *China rubra* of Bergen and other German pharmacographers. It includes the *Quinquina rouge non verruqueux* and the *Quinquina rouge verruqueux* of M. Guibourt.

Commerce.—It is imported in chests; never, I believe, in serons. Good red bark may be regarded as comparatively scarce; and I am informed by an experienced dealer that it was formerly imported in much larger sized pieces than are now met with.

Characters.—It occurs in quills and flat pieces. The quills vary in diameter from two lines to an inch and a quarter; in thickness from one-third to two lines; in length from two to twelve or more inches. The so-called flat pieces are frequently slightly curled: their breadth is from one to five inches; their thickness from one-third to three-quarters of an inch; their length from two inches to two feet. Red bark is usually coated; its outer surface is usually rough, wrinkled, furrowed, and frequently warty: the presence of warts constitutes the variety called by Guibourt *Quinquina rouge verruqueux*. The color of the epidermis varies: in the thinner quills it is grayish brown, or faint red brown; in thick quills and flat pieces it varies from a reddish brown to a chesnut brown, frequently with a purplish tinge. As a general rule it may be said that the larger and coarser the quills and pieces, the deeper the color. Cryptogamic plants are not so frequent on this as on some other kinds of bark. The rete mucosum is frequently thick and spongy in red bark, much more so than in yellow bark. The inner surface of the bark is, in fine quills, finely fibrous; in large quills and flat pieces, coarsely fibrous, or even splintery: its color increases with the thickness and size of the pieces: thus in fine quills it is light rusty brown; in thick quills and flat pieces it is a deep reddish or

purplish brown. Some of the specimens of red bark which I received from Von Bergen approach yellow bark in their color. The transverse fracture is, in fine quills, smooth; in middling quills, somewhat fibrous; in thick quills and flat pieces, fibrous and splintery. The taste is strongly bitter, somewhat aromatic, but not so intense and persistent as that of yellow bark; the odor is feeble, tan-like: the color of the powder is faint reddish-brown.

Botanical history.—The tree which yields red bark of commerce is at present unknown. It has been usually supposed to be obtained from the *Cinchona oblongifolia*, but this is in all probability erroneous. This species of *Cinchona* yields a bark called *Quina roxa* or *Quina Azahar o roja de Santa Fe*; and which was supposed to be our red bark. But Bergen has examined the bark bearing this name in the collection of Ruiz, and finds that it is not our commercial red bark, but another kind, known in France by the name of *Quinquina nova*. Moreover, Schrader (who received a piece of the bark of the *Cinchona oblongifolia* from Humboldt) declared it to be a new kind; and Guibourt states that the red bark of Mutis, which was deposited by Humboldt in the Museum of Natural History of Paris, is not commercial red bark, but *Quinquina nova*. To these statements may be added the testimony of Ruiz and Pavon, and of Humboldt; the two first of which writers state that the *Quina roxa* is obtained from the *Cinchona oblongifolia*, but that they do not know the origin of *Quina colorada* (the red bark of commerce;) and Schrader states that Humboldt declared he did not know the tree that yielded red bark.

Chemical composition.—Pelletier and Caventou analysed the non-verrucous variety of red bark, and found the following constituents:—

A large quantity of *superkinate of quinia* and of *superkinate of cinchonina*.

Slightly soluble red coloring matter (*red cinchonina*.)

Soluble red coloring matter (*tannin*.)

Yellow coloring matter.

Fatty matter.
Kinate of lime.
Ligneous matter.
Amidine.

Several persons have attempted to determine the absolute and relative quantities of cinchonia and quinia obtained from the varieties of red bark.

From one pound of Bark

<i>Von Santen's Results.</i>	Cinchonia.	Sulphate Quinia.
1. Fine quills of fresh appearance (from Cadiz, in 1803)	70 grains.	77 grains.
2. Large, broad, flat pieces, of fresh browned appearance (same chest)	90	15
3. Middling quills, from their pale appearance probably 20 years older than the previous (from Cadiz in 1819)	97	31
4. Broad flat pieces, not so thick as No. 2, (same chest as No. 3)	80	30
5. Middling quills, heavy, old (from London to Hamburgh in 1815: not met with now) .	150	11
6. Thicker heavier quills (same chest) .	184	9
7. Thick flat pieces, quills, and fragments (above 80 years in Hamburgh: a pale kind)	20	7

The following are the results of other chemists:—

	Cinchonia.	Quinia.
Michaelis obtained from 1 lb. of bark	32 grains.	64 grains.
Goebel and Kirst (quills and flat pieces)	65	40

(*d.*) *Brown Bark (Cinchona fusca.)*

6. *Huamalies, or Brown Bark.*

History and synonymes.—It is not known precisely when this kind of bark first came into Europe. Von Bergen thinks probably at the end of the last or commencement of the present century. This bark is not used in this country, and hence most druggists are unacquainted with it; but it is bought by some of our larger dealers for the foreign market.

Commerce.—It is imported in chests; never in serons.

Characters.—It is a thin, spongy bark, and occurs in quills and flat pieces. Many of the quills agree in their physical characters with that kind of bark which our druggists denominate *rusty*, and which is picked out of the serons of Loxa

bark. Some of the finer and thinner quills agree in their appearance with what the French term *Havannah bark*, (in consequence of which Guibourt arranges Huamalies bark among the gray or pale barks,) and are very different to the largest quills and flat pieces, which are thin and spongy, and have a rusty brown color, their external surface having numerous wrinkles and warts. The taste of Huamalies bark is aromatic, and slightly astrigent.

Botanical history.—It is not known what tree yields this bark.

Chemical history.—I am not acquainted with any regular analysis of this bark. From the experiments of Michaelis, as well as of Goebel and Kirst, it appears to contain quinia and cinchonina.

In a pound of Bark.

		Quinia.	Cinchonina.
Michaelis	{ 1st sort . .	12	..
	{ 2d sort . .	28	48
	{ 3d sort . .	34	60
Goebel and Kirst . . .		28	38

Section 2.—*True Cinchona Bark having naturally a whitish epidermis. (White Cinchonas.)*

I think it most convenient to arrange these under three heads, according as they approach the pale, yellow, and red barks, already described.

(a.) *Pale Barks, with a White Epidermis.*

1. *White Loxa Bark.*

Among the Loxa or Crown bark of commerce, we meet with quills having a white epidermis. Guibourt calls them *Quinquina blanc de Loxa*.

(b.) *Yellow Barks, with a White Epidermis.*

2. *Carthagen Bark.*

History and synonymes.—It is uncertain how early this bark was introduced into Europe. Bergen says it was first met with at public sales, in the year 1805. In Germany it is denominated *yellow bark*, (*Cinchona flava*), and hence it has sometimes been confounded with and substituted for the

yellow bark of English commerce, which is called on the continent Calisaya, or Regia bark.

Bergen speaks of two distinct kinds of Carthagena bark.

1st. The *china flava fibrosa*, called in this country *fibrous* or *woody Carthagena bark*, and which I find to be identical with a specimen sent me by M. Guibourt, under the name of *Quinquina de Colombie ligneux*.

2. *China flava dura*, or *hard Carthagena bark*, which includes the *Quinquina de Carthagene jaune*, and the *Carth. brun*, of Guibourt.

As both kinds are imported in the same parcel, and from the same place, and are sold as one kind here—as both appeared in commerce for the first time together—and as their physical appearances are very similar, I shall consider them as one kind. Geiger suggests whether they may not be the bark of the same species at different seasons, or growing in different situations.

Commerce.—It is imported in drum-like serons, and in half chests.

Characters.—It occurs in quills and flat pieces, the leading characters of which are the thin soft epidermis, whose color is between yellowish white and ash gray, with a micaceous appearance: sometimes the epidermis is wanting. The color of the inner surface and other parts of the bark is ochre yellow. The transverse fracture is fibrous and splintery, especially in the variety called from this circumstance *fibrosa*. The odor is slight, the taste slightly bitter, and astringent. The color of the powder varies from that of cinnamon to ochre yellow.

Botanical History.—I have already mentioned in speaking of the yellow bark of English commerce, that Carthagena bark is obtained from the *Cinchona cordifolia*.

Chemical history.—Pelletier and Caventou have analysed one kind of Carthagena bark (Guibourt says it was the variety he terms *brown*), and obtained the following results:—

Kinates of quinia and cinchonia.

Yellow coloring matter.

Tannin.

Red Cinchonic.

Gum.

Amylum.

Kinate of Lime.

Lignin.

Various experiments have been made to ascertain the quantities of Quinia and Cinchonia present. The following are the results of Goebel and Kirst:

	Quinia.	Cinchonia.
1lb. hard Carthagena bark . . .	56 grs.	43 grs.
1lb. fibrous Carthagena bark . . .	54 grs.	no trace.

If this analysis be correct, it certainly shows a remarkable distinction between the two kinds.

3. Cusco Bark.

This bark has only been known during the last seven years. It is the *Ecorce d'Arica* of Pelletier, and *China rubiginosa* of Bergen; but it is not described in the monograph of this last writer. It is characterized by a white, smooth, uncracked epidermis; which, however, is sometimes partially or wholly removed by the orange red tint of the other parts of the bark, by its fibrous appearance, and lastly, by an infusion of it not precipitating a solution of the sulphate of soda. This bark principally deserves notice in consequence of MM. Pelletier and Coriol having discovered in it a new alkali, which they have termed *Aricina*.

(c.) Red Barks with a White Epidermis.

4. Cinchona Nova.

History and synonymes.—The *Quinquina nova* is placed by Guibourt among the false Cinchonas, though I know not for what reason, since he asserts it is the red bark of Mutis, which is obtained from the *Cinchona oblongifolia*. In speaking of the origin of the red bark of commerce, I have already mentioned that Bergen declares the *Quina roxa* (obtained from *C. oblongifolia*) of Ruiz's collection, to be the *Quinquina nova* of commerce. On these grounds, then, I

have placed this bark among the genuine Cinchonas. It is also called, by some pharmacologists, *Surinam bark*.

Characters.—It occurs in flat or arched pieces, or even quills sometimes a foot long: its epidermis is smooth, whitish, with few cryptogamic plants, with transverse cracks or fissures. The general color of the bark is pale red, but which becomes deeper by exposure to the air. It has an astringent somewhat bitter taste. In general appearance it has no resemblance to any other Cinchona barks (true or false) that I am acquainted with.

Botanical history.—I have already mentioned the facts from which we infer its origin from the *C. oblongifolia*.

Chemical history.—It has been analysed by Pelletier and Caventou, with the following results:

A fatty matter.

Kinovic acid.

A red resinoid matter.

Astringent matter.

Gum.

Starch.

Yellow coloring matter.

Alkalescent matter in very small quantity.

Lignin.

5. *Other Red Barks with a white epidermis.*

Among the red bark of commerce we frequently find samples having a white epidermis. This is the kind called by Guibourt *Quinquina rogue à épiderme blanc et micacé*. There is another paler kind which he terms *Quinquina rogue pâle*.

Div. II.—*False Cinchona Bark.*

Under this division are placed those barks which have been introduced into commerce as Cinchonas, but which are not obtained from any species of Cinchona. Their physical characters are for the most part very different from those of the genuine: moreover, they are not known to contain quinia, cinchonina, or aricina. I do not intend to describe them, but shall content myself with naming, as examples, the *Pitaya* or *Bi-colored bark*, the *Piton* or *St. Lucia bark*, the *Caribbean bark*, &c.

ART. XLVII.—ON THE USE OF GOLD-DUST AND IRON-FILINGS AS A GALVANIC ANTIDOTE TO CORROSIVE SUBLIMATE, AND ALL THE OTHER POISONOUS COMPOUNDS OF MERCURY. BY T. H. BUCKLER, M. D., of Baltimore.

THE compounds of mercury being, without exception, more or less poisonous, it would seem that the only single method of rendering them innocuous, is to revive the metallic mercury, and thus separate it from the agents with which it is combined. Of all the compounds of mercury, corrosive sublimate—*bichloride of mercury, oxymuriate, corrosive muriate*—is the one for which it is most desirable to procure a suitable antidote. It is somewhat curious that this agent, possessing so wide a range of chemical affinities, should have baffled chemists and toxicologists for so long a time, in their numerous efforts to find some direct chemical agent capable of decomposing it in the stomach, and thereby prevent the corrosive and deadly action which so surely follows its presence—unless in the smallest quantity—in that organ. The difficulty has arisen, of course, from the more or less poisonous nature of all its compounds. It has even been shown that corrosive sublimate possesses the properties of an acid, and unites with the alkalifiable bases; but here, as in other instances, the compounds resulting are even more intense irritants than the bichloride itself. The inutility of finding an antidote to an agent so deadly in its effects, may be urged by many, although it is not a more powerful irritant than oxalic acid, for which latter we have, luckily, a ready and certain antidote, and on this account alone, we are enabled to predict a very different result where it has been taken into the stomach, than we would be likely to foretell if corrosive sublimate were swallowed. It is therefore idle to say, that it is useless to attempt to find some more certain antidote to this most deadly poison: more especially, when even the observations that have been made on poisoning with prussic acid, have been productive of practical

advantage. In this view, the importance of having a suitable antidote, is growing daily more apparent; for, setting aside the instances in which it may be taken with suicidal intent, and the risks incurred by its universal employment in destroying insects, it is extensively used in the arts, and has been introduced of late, especially in the operation of tanning, and also to prevent the decay of timber: thus exposing a numerous class of operatives to the accident of swallowing it. Even a familiar acquaintance with the deadly nature of corrosive sublimate, is not always a guarantee against the risk of taking it into the stomach. Thenard, the chemist, while at lecture, on one occasion swallowed a concentrated solution of this salt, in place of water, but luckily discovered his mistake before he had taken enough to prove fatal. A druggist of our city, while talking, inadvertently took from his counter a lump of the bichloride and swallowed it. He had fortunately eaten a full meal a short time before, and on taking an emetic of sulphate of zinc, the piece was instantly rejected, with the contents of the stomach. It is well known that numerous agents have been at various times suggested as capable of rendering this salt innocuous. The only antidotes now recognised are gluten and albumen; the former having been suggested by Professor Taddei, of Florence—the latter by Orfila. Each of these promised to be perfect when first announced; but that of Orfila, for many reasons the best, is now the established antidote. Recent investigations have shown that albumen is not so certain in its action as was at first supposed, it having been ascertained that the precipitate which it forms, is re-dissolved when the albumen exists in excess. "The precipitate is soluble in a considerable excess of albumen: so that whenever albumen abounds in any fluid to which corrosive sublimate has been added, a portion of the mercury will always be found in solution."—*Christison*, p. 279. It is therefore apparent, if this be true, that if it were possible to know the quantity of the solution our patient had taken, we could not, in the hurry of administering albumen, (even if we knew the exact quantity required,) give just so much as would neutralize the so-

lution, but must be constantly liable to the error of giving too little, or so much as to keep the salt of mercury in solution. Albumen acts by causing the disengagement of one portion of chlorine, thus converting the bichloride into calomel, which renders the patient liable to be salivated, an evil which, if none other existed, it would be as well if possible to prevent; besides, toxicologists number calomel amongst the compounds of mercury for which it is desirable to procure an antidote. Perhaps another reason why the exhibition of albumen is not followed with better success, arises from the fact that corrosive sublimate is not more active in its affinity for albumen than for the mucous membrane of the stomach itself; the experiments of Berthollet having shown that the same power of reducing the bi. to a protochloride, belongs to all animal solids and fluids. On this account, no chemical diversion can be excited by the presence of the albumen, since the solution of mercury does not unite with it by virtue of any peculiar elective attraction, over that which it has for the tissues of the stomach and bowels; on which latter it exerts its energies often to a fatal extent, although albumen is present in them at the time.

Not long since, we were called to witness a most melancholy case of poisoning in a young gentleman of robust health, who had swallowed, with suicidal intent, three ounces and a half of a saturated solution, (about fifty-five grains,) of corrosive sublimate. Eggs were at hand, and ten minutes had not elapsed from the time he took the poison, when we gave him at least a quart of a solution of albumen, and continued to administer it for some hours. It is not our purpose to state this case fully; suffice it to say, that the symptoms were such as are usually described, and most violent. There is one circumstance, however, worthy of notice in this place, as it serves to show the weight of the objections above stated—it is this:—The bowels were not acted on until nearly three hours after the solution was swallowed, (ample time, we should think, for the affinities of the mercury to have been supplied by the albumen,) and yet, when the dejections did take place, they

contained so much mercury in solution, that the skin surrounding the anus was excoriated, precisely as if a strong solution had been directly applied. In spite of the albumen, which was largely administered, the corrosive action was exerted on the mucous membrane of the stomach and bowels for eight hours, producing during the whole of this time the most excruciating agony. So soon, however, as the chemical action was at an end, there was comparative calmness and freedom from pain. He died on the eighth day; and we feel warranted in the belief, that had we possessed some agent capable of decomposing the solution within the first half hour, his chance of recovery would have been good. We do not mean to disparage the importance of albumen as a demulcent and diluent, and are disposed to believe that more good is to be attributed to these qualities, than to its chemical agency.

It would seem, then, that the object is still to obtain an antidote, for which corrosive sublimate possesses affinities largely predominant over the tendency it has to combine with animal constituents, and it is with the hope of fulfilling this indication, that we have been induced to make the following experiments. The agents by which we propose to render the bichloride innocuous, are iron-filings and gold-dust: it will be at once seen that their mode of action is referrible solely to the phenomena of galvanism. Thus, if we place a drop of a solution of corrosive sublimate on a polished piece of gold or iron, the surface of the two metals will remain bright at the point covered by the drop for a long time, unless we bring the iron and gold in contact, through the solution, when both metals become instantly tarnished: the iron oxydized, and the gold coated over with metallic quicksilver. If we drop into a solution of mercury a polished card-tooth, to which we have caused particles of gold to adhere, it will become tarnished the moment it comes in contact with the fluid, and a globule of quicksilver combined with the gold, may be seen hanging to it, as it falls to the bottom of the solution. If, in like manner, we throw gold-dust into a solution of mercury, no action will take place until we add iron-filings, when the metallic mer-

cury is at once revived, and will be seen to precipitate in a state of amalgam with the gold: at the same time, the oxygen from the corrosive sublimate goes over to the iron, and forms an oxide of that metal, with which the chlorine combines, leaving a hydrochlorate of iron in solution. The products of this decomposition are wholly innocuous, the amalgam of the two metals being entirely inert, and the hydrochlorate of iron possessing only the properties of a slight tonic. Two grains of gold and two of iron are sufficient to decompose five grains of corrosive sublimate, so that no trace of mercury can be detected by the most delicate test.

In order to insure a rapid decomposition of the salts of mercury, it is important that both metals should be in the minutest state of division. The iron we made use of was reduced almost to an impalpable powder, by working a piece of steel with the finest file. The gold can be procured at all times, in the state of bronze; as this is liable, however, to impurities, it is better to have it prepared expressly for the purpose, in the ordinary way of reducing it to powder, or by filing. Gold-leaf may also be used. Both metals should be so minutely divided, as to be capable of suspension for a short time, in any fluid, and form, when agitated in water, as it were, a gold and iron solution. For it is the galvanic action excited at the moment, that each particle of one metal comes in contact with a particle of the other, that the corrosive fluid immediately surrounding them is decomposed; and hence, in order to render rapidly innocuous a considerable bulk of a solution of corrosive sublimate, it is important that both metals should be as widely and intimately diffused in it as possible. This method of decomposing the bichloride, applies with equal force to all the more soluble compounds of mercury for which no antidote has yet been suggested. The deuto-iodide of mercury in water, is instantly deprived of its bright vermilion lustre, on the addition of gold and iron, and a gray precipitate, composed of an insoluble iodate of iron and an amalgam of gold and quicksilver, is the result. If we take the peroxide of mercury, (red precipitate, red oxide of mercury,) and

throw in gold and iron-filings, the oxygen of the precipitate instantly passes over to form a peroxide of iron, while the revived quicksilver amalgamates with the gold. So likewise, the proto-nitrate and acetate mercury, when similarly treated, form severally a nitrate and acetate of iron, while the metallic mercury being revived, combines of course with the gold.

The more insoluble compounds of mercury, for which it is extremely desirable we should possess an antidote, are not so readily decomposed by the presence of gold and iron: but we are aware at the same time, that this class of agents act more slowly on animal tissues, and also that some soluble salt must be formed, by the action of the stomach, before they can prove deleterious. These compounds are, first, cinnabar—*bisulphuret or vermilion*: second, turbith mineral or *sub-bisulphate*: third, white precipitate or *hydrargyrum ammoniatum* of the Pharmacopœia: amongst these, calomel may also be classed. Now, before any of the last named substances can prove deleterious, some soluble salt must be formed by the action of the stomach, which, when formed, instead of acting on the coats of the stomach, will be decomposed by the presence of gold and iron, as we have before seen in regard to the other soluble salts. It was our intention to have made a number of experiments on animals, aided by Professor W. R. Fisher,* who

* This gifted son of Pennsylvania, during twelve years' residence in our city, devoted his time and the energies of a highly cultivated intellect, almost solely to the study of chemistry and pharmacy. Two summers since he was called, unsolicited on his part, to the chair of chemistry in the University of Maryland, a station which he occupied with distinguished credit to himself, and marked advantage to his class. His lectures, written in a style remarkable for its elegance and force, were delivered in a manner at once animated and natural, while the happiest facility of illustrating, by experiment, the numerous and varied points under discussion evinced a familiarity with chemical manipulations, which can only be acquired by long experience. That he possessed, indeed, all the qualities essential to an accomplished and eloquent teacher of chemistry, was accorded by all who had the gratification to hear him. Ever ready to take the lead in any thing useful or scientific in its objects, he had laid plans to establish a College of Pharmacy in our city. During the past spring, in the pride of youth and usefulness, he had the misfortune to be attacked

kindly offered his assistance; but owing to the late illness of this gentleman, our plan was defeated. For the purpose, however, of ascertaining how far the proposed antidote can be depended on, when brought to the test of positive experiment, and to be assured that no deleterious compounds result from this method of decomposing the salts of mercury, we procured four half grown rabbits, on which the following experiments were performed, assisted by Mr. D. Stewart, one of the ablest chemists and pharmacologists of our city, and well known to the profession generally on account of his valuable contributions to the American Journal of Pharmacy.

Experiment 1st.—Injected into the stomach of a half grown rabbit, one grain of the peroxide of mercury in $\mathfrak{z}\text{ii}$ of water, and shortly after, five grains of iron-filings and the same quantity of gold-dust, in half an ounce of water. This rabbit manifested no pain or distress of any kind; began to eat shortly after the experiment was performed, and has not since appeared the least sick.

Experiment 2d.—Gave in like manner, to a rabbit of the same size and strength as the preceding, three grains of the deuto-iodide of mercury in $\mathfrak{z}\text{ss}$ of water, and used as an antidote, gold-dust and iron-filings, each six grains: result the same as in the preceding experiment; this rabbit is now thriving.

Experiment 3d.—Injected into the stomach of another rabbit of the same size and age, three grains of the white oxide of mercury, and some minutes after, administered four grains of finely divided gold and five of iron-filings: the rabbit appeared perfectly well until the next day, when it lost its

with partial paralysis of one side, which induced him, so soon as he had sufficiently recovered, to abandon the arduous duties of his occupation here, and seek repose at home. We rejoice to hear that he is rapidly convalescing, and we sincerely hope that he may soon regain his health, and be enabled to reap the ripe harvest of his well spent time, in the continued pursuit of a science to which his talents promised to lend important aid.

appetite and seemed drooping and sick; on the third day it commenced eating, and is now perfectly well.

Experiment 4th.—Injected into the stomach of the last rabbit, four grains of corrosive sublimate in $\frac{3}{4}$ ss of water, and used as the antidote, four grains of gold-dust and six of iron-filings in $\frac{3}{4}$ ss of water: this rabbit began to eat shortly afterwards, manifested no distress, and is now perfectly well.

In all of the above experiments, a small quantity of gum was added to the antidote, for the purpose of suspending the metals. It being impossible to know, *a priori*, that gold and iron in a minute state of division, might not alone prove fatal to a rabbit, our first experiment was made more to determine the effect of the antidote itself: therefore only one grain of the peroxide of mercury was given—a quantity insufficient to produce death; and yet calculated to give rise to great distress, or at least loss of appetite, unless decomposed by the antidote. It appeared to be conclusive from this trial, that gold and iron exert no deleterious effect, and also that the peroxide must have been decomposed, inasmuch as the rabbit began to eat shortly after the experiment was performed, and has not since appeared the least sick. Dr. Niel has recommended an ointment, composed of one grain of finely divided gold to thirty-six of lard, to be applied to a blistered surface, in scrofulous affections, as a substitute for the hydrochlorate and other preparations of that metal. What possible effect Dr. N. could have anticipated from this plan of treatment, we are at a loss to determine, since gold is only soluble in nitro-muriatic acid, and cannot, therefore, undergo any change if applied to a blistered surface, or introduced into the stomach. We believe that one grain of the deuto-iodide of mercury would be sufficient to kill a rabbit, and we are justified in this belief, from the distress often occasioned where it is administered medicinally, in doses of one-eighth of a grain: and yet, in our second experiment, three grains of this agent were given, without any sensible effect.

We have before observed, that gold and iron do not decompose the more insoluble compounds of mercury, when brought

in contact out of the stomach. The action of these metals as an antidote to the insoluble compounds of mercury generally, and their effect in our third experiment, in which three grains of the white oxide of mercury* were given, may, however, be explained by the phenomena which occur in one of the methods of making hydriodate of potash: it is known to chemists, that iodine and potash may remain in water without forming the above salt, unless a piece of iron be dropped in, when a play of affinities is at once aroused, and the iodine, leaving the iron, for which it has a powerful affinity, untouched, combines instantly with the potash. Now a part analogous to that which the iron here plays, is performed by the stomach, when the insoluble compounds of mercury are swallowed, and gold and iron are at the same time present:

* A medical gentleman of our city, ordered for a convalescent patient half an ounce of phosphate of soda; the prescription was taken to an apothecary, who sent, in its stead, half an ounce of white oxide of mercury. The nurse in attendance, when about to mix and administer the dose, suspecting it was not the medicine intended, sent it back to know if it was right; the apothecary, whose hardihood only equalled his ignorance, declared it to be the medicine ordered. With this assurance, the nurse prepared and gave to the unfortunate patient, the whole half ounce of white oxide, which soon produced the most violent symptoms, and proved fatal in about thirty-six hours. A short time after the dose had been given, the physician was sent for, and believing his patient had taken poison, he went to the apothecary and asked to see the bottle from which his prescription had been supplied: he was shown a bottle marked phosphate of soda; but which was found, on examination, to contain white oxide of mercury, the apothecary still persisting to the contrary: sufficient evidence that the mistake was not the result of accident, but could only be attributed to the grossest ignorance.

This fact, like many others that might be adduced, shows the absolute importance of our having a College of Pharmacy; indeed, in every place where physicians have, very properly, ceased to keep their own medicines, and have resigned into the hands of others one of the most important branches of our science, a College of Pharmacy, with full power to grant diplomas, appoint inspectors of medicine, and regulate the sale of poisons, has been found indispensable. So intimately is the apothecary identified with the physician in the public mind, that any fault of the former will be visited on the latter, and any act of ignorance on the part of a dispenser

the stomach forms, out of the insoluble compounds, a soluble salt, which instead of acting on the coat of that organ, is instantly decomposed by the antidote. The stomach, in every instance, being the medium, like the iron in the case of the iodine and potash, by which the affinities are brought into play.

The experiments of Sir B. Brodie and others have proved that where a solution of from six to twenty grains of corrosive sublimate is injected into the stomach of a full grown rabbit, it very soon produces difficult respiration, convulsions, and soon after death. In our last experiment, therefore, in which a solution of four grains of corrosive sublimate was injected into the stomach of a half grown rabbit, death must have ensued, unless the gold and iron had been given.

A solution of corrosive sublimate acts on the stomach purely as an irritant, or as a caustic, accordingly as a weak or strong solution is swallowed. Toxicologists have not, so far as we know, made any practical distinction between the irritant and

of medicine affects the confidence of the people in the science generally in proof of which, it is only necessary to remember the want of confidence felt by all who dealt with apothecaries, for some time subsequent to the melancholy instance above stated. It is through the same channel, that medicine will become undefinably associated in popular estimation with quackery: for how is it now? The able chemist and pharmacologists in whom the physician places a well merited confidence, is not clearly distinguished from the commonest retailer of drugs without knowledge of their qualities, or the notorious vender and advertiser of quack nostrums. In the present exact and elevated state of our science, it is right that it should be severed from all connexion with every thing which has even a shadow of quackery; and we feel confident that nothing will effect this end, repress the evils already pointed out, and tend, at present, so much to supply the wants of our profession, as the establishment of a College of Pharmacy.

The city council of New Orleans have lately, in a commendable spirit, enacted laws prohibiting the publication of quack remedies, having imposed a fine of twenty dollars on any one who advertises a specific in the daily journals, and a penalty of one hundred dollars is incurred for the offence of placarding a remedy at the corners of the streets. We can scarcely look at a daily newspaper, without seeing at a glance, certificates palming off the virtues of some notorious patent specific, the advertisement of quack nostrums by an apothecary, and the wonderful perform-

caustic strength of a mercurial solution, but we deem it of the greatest importance, in the treatment of poisoning with corrosive sublimate, to notice the difference. A solution of this salt, in its caustic strength, will produce an irrecoverable condition of things in a few minutes; whereas a solution only irritating in effect, may remain on the stomach for a greater length of time, without producing any fatal lesion. For example: we applied a saturated solution of corrosive sublimate to a blistered surface; it produced the most excruciating torment, and on examining the surface some hours after, the true skin had lost its vitality in patches, which presented a white polished, and shining appearance; about the third day, all the parts which had assumed the character described were found separated at their margins from the healthy skin, by a clearly defined fissure, and between the sixth and tenth days, they came away, leaving healthy ulcers, with perpendicular walls, and corresponding exactly to the thickness of the skin in

ance of some ycleped surgeon. So long as this hybrid jumble of science and quackery comes daily before the public eye, it is useless to inveigh against mountebanks, and not to be wondered at, that a man when he is taken sick, should doubt whether to send for some specific, or a physician. We expect soon to see some journal which shall be devoted to science, surgery, quack specifics and the fine arts; and until such publication shall appear we think surgeons who do not wish to incur an empirical reputation, would do well to confine themselves to the pages of a medical journal, and all apothecaries, who desire the patronage of physicians, would be wise to discontinue the advertisement and sale of quack specifics. The small capital required to establish an apothecary shop, and the large advance on the sale of medicine in small quantities, offers an inducement for a great many disqualified individuals to embark in the business. The profit arising from the sale of drugs, is no more than a fair compensation to those who have spent previous years of hard labor, in making themselves chemists; but in the case of all such as become apothecaries out of mere thrift, the profit is unjustifiable and the pursuit itself criminal. Many of these worthies are in the habit of prescribing and administering extemporaneously, to a large number of the ignorant and credulous, who are incapable of distinguishing between them and the well educated physician. One of these *quasi* doctors who set up a drug store some time since, was called on by a old lady, to know if he could not give her some-

depth. These sores healed up in a few days by granulations from their bases. On the contrary, if we apply a weaker solution, (ten grains to the ounce,) to a blistered surface, it produces an acute burning pain, the true skin will afterwards be found inflamed, but no lesion will have taken place. With these facts before us, it would seem proper in all cases where a saturated solution has been swallowed, to give a quantity of water sufficient to dilute the solution contained in the stomach, to such an extent as to destroy its caustic action, which, if not instantly arrested, must render death inevitable. By adopting this course we should prevent the direct caustic effect of the solution, we have time to procure the antidote, which should be given in all cases so soon as it can be obtained, and in the after treatment we should have simple inflammation, instead of death, of the mucous coat of the stomach to contend with. We must recollect, however, that the mercurial solution is rendered more slow, but not less certain in its fatal effect, by dilution; no time is therefore to be lost in decomposing it. A gentleman, at one of our principal hotels, ordered a glass of cider, in the act of swallowing the first mouthful of which, he

thing for nettle rash, (urticaria.) The doctor examined the eruption very carefully, and came to the conclusion that cream of tartar was the remedy, and forthwith prepared the dose. The old lady was loath—instinctively, perhaps—to take any thing internally, and said she would prefer some external application: the doctor persisted, however, that he had hit on the proper remedy, and in order to overcome the objections of his patient, took half the dose himself, declaring, at the same time, that it was not unpleasant to the taste; which argument proved irresistible, and his patient swallowed the other half, and then took a seat, whether for the purpose of ascertaining before she left the shop that she had not taken poison, or from an indisposition to move, we cannot say. Meanwhile, the doctor, delighted at his prowess, related most eloquently other instances of his success, and doubtless thought this last act ominous of a brilliant reputation. He was interrupted, however, by violent sick stomach, which his patient began also to experience. Great consternation arose, and a medical gentleman was sent for, who found, on his arrival, that the modern *Æsculapius* had given, by mistake, tartar emetic instead of cream of tartar. The truth of this incredible performance is attested by the respectable medical witness who was sent for at the time. Wherein is the utility of laws prohi-

was warned by the burning taste of the fluid, that he taken something wrong; in a few minutes he was seized with the most violent, burning pain in the stomach, and along the line of the œsophagus. A physician was sent for, who found on his arrival, that a saturated solution of corrosive sublimate, in whiskey, had been taken instead of cider. Albumen was freely administered, in spite of which the symptoms grew more violent, and death ensued on the third day. The mistake originated in the heedlessness of a servant, who after using the corrosive solution for the purpose of cleansing bedsteads, had carried the bottle in which it was contained to the bar, and placed it on the shelf where the cider was kept. Now, in all cases similar to the one just stated, in which a solution of mercury was swallowed in a very concentrated state, it would be proper to administer, immediately, a draught of water sufficient to destroy its caustic properties, and then to give the antidote as soon as it can be obtained. We would

biting the practice of physic unless under the authority of a diploma, if the pretext of keeping an apothecary shop is always a ready means of evading them? The importance of having suitable persons appointed to inspect the drugs sold in our market is obvious; we have inspectors of flour and tobacco, of the excellence of which the dealer, as well as the consumer, is a fair judge, and yet medicines, the character of which none but a good chemist can determine, are permitted to pass from hand to hand, and to be given in the conflict between life and death, without any security that they are calculated to meet the indication for which they are used, or their having come under the eye of any one competent to judge of their qualities. The fact is notorious, that large sums are annually made by the manufacture of adulterated chemicals, and it is equally well known to the profession, that two-thirds of the medicine sold in our drug stores is utterly worthless: without some system of inspection, our city will become the vortex for drugs which have been rejected in other markets. The merest culler and vender of simples is permitted to keep and sell the most deadly poisons, and is consequently, at all times, the ready accomplice of any caitiff wretch who may choose to procure them with criminal intent. In a notorious case of trial for homicide, by poisoning, which came before our criminal court a few years since, it was impossible to ascertain from whence the poison had been procured.

recommend the proposed antidote to be kept by the apothecary in papers, containing each,

Finely divided gold,

————— iron, à à-℥ii.

Gum acacia, 3ss. M.

These powders should be kept free from dampness, in order to prevent the oxidation of the iron: in case of poisoning with any of the compounds of mercury, one of these powders is to be stirred into a tumbler of water and swallowed; if any of it should be rejected, another powder should be given. If a solution of mercury were swallowed, we could not expect much benefit to arise from the use of gold and iron in any other state than that of dust. We should not hesitate, however, in case of poisoning with the insoluble compounds of mercury, if the dust could not be obtained, to use these metals in the form of beads, fine chains, or any other shape in which they could be conveniently swallowed, for we believe they would decompose the soluble salt, with as much rapidity at least, as it could be formed in the stomach.

We have made these remarks for the purpose of inviting the attention of others to the subject; it is our intention, however, to renew and perfect the experiments already made.

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ART. XLVIII.—NATIONAL MEDICAL CONVENTION.

THE National Medical Convention for the revision of the Pharmacopœia of the United States, assembled in the City Hall, Washington, on the 1st day of January, 1840.

The following delegates represented their respective Medical Societies and Colleges in the Convention, viz. :

Rhode Island Medical Society—Theophilus C. Dunn, M. D.

New Jersey Medical Society—Lewis Condict, M. D.

The College of Physicians of Philadelphia—Franklin Bache, M. D., Henry Bond, M. D., Joseph, Carson, M. D.

University of Pennsylvania—Geo. B. Wood, M. D.

Jefferson Medical College—Robley Dunglison, M. D.

Delaware Medical Society—William B. Morris, M. D., James Couper, M. D.

Washington University, Baltimore—John R. W. Dunbar, M. D., John C. S. Monkur, M. D., Edward Foreman, M. D.

Medical and Chirurgical Faculty of Maryland—Joshua J. Cohen, M. D.

Medical Society of the District of Columbia—Thomas Sewall, M. D., N. W. Worthington, M. D.

Columbian Medical College—Thomas Miller, M. D., Harvey Lindsly, M. D., John W. Thomas, M. D.

Vincennes Medical Society of Indiana—John W. Davis, M. D.

Georgia Medical Society—William Bacon Stevens, M. D.

The credentials of the delegates from the White Mountains Medical Society of Vermont, from the Medical Society of New Hampshire, from the Albany Medical College, and from the College of Physicians and Surgeons of Lexington, Kentucky, were presented by Dr. Condict, President of the Convention of 1830 ; but the delegates were prevented from attending. After the rising of the Convention, however, Josiah Bartlett, M. D., delegate from the New Hampshire Medical

Society, and Samuel G. Baker, M. D., and William A. Aiken, M. D., delegates from the University of Maryland, reached Washington ; and, by public notice in the papers, stated their full concurrence in the measures adopted by the Convention.

The Convention elected Lewis Condict, M. D., of New Jersey, President ; George B. Wood, M. D., of Philadelphia, Vice President ; N. W. Worthington, M. D., of Georgetown, D. C., Secretary ; and Harvey Lindsly, M. D., of Washington, Assistant Secretary.

With the view of giving the various medical interests of the country their due weight in the deliberations of the Convention, the Surgeon General of the Army, and the Senior Naval Surgeon at Washington, were invited to participate in the proceedings.

After some other preliminary business, the Convention adopted the following resolution, offered by Dr. Bache :

Resolved, That the delegates from the different medical bodies represented in this Convention, be requested to present any written communications with which they may have been charged.

Upon calling over the several delegations, it appeared, that no written communication had been forwarded to the Convention, except by the College of Physicians of Philadelphia. Dr. Bache presented from this College several documents, which he stated had been prepared with great industry and care, with a view to facilitate the revision and emendation of the Pharmacopœia of 1830. This communication elicited discussion ; but with a view to more definite action, Dr. Lindsly proposed the following resolution, which was adopted.

Resolved, That the communication from the College of Physicians of Philadelphia be referred to a Committee, who shall also be instructed to report a plan by which the revision and publication of the Pharmacopœia may be carried into effect.

It was resolved that the Committee should consist of five members, to be named by the President ; and Drs. Bache, Davis, Stevens, Cohen, and Dunn, were appointed.

Dr. Wood offered the following proposition, which was adopted.

Resolved, That a Committee be appointed to report a plan for the organization of the next Convention for revising the Pharmacopœia.

It was ordered that the Committee consist of three members, to be named by the President ; and Drs. Wood, Sewall, and Dunglison, were appointed.

The Committee to whom the documents from the College of Physicians of Philadelphia were referred, and whose duty it was to arrange a plan by which the revision and publication of the Pharmacopœia might be carried into effect, made the following report, which, with the accompanying resolution, was adopted by the Convention :

“The Committee are of opinion, that the labors of revision, constituting the communication from the College of Physicians, would form a proper basis for the new Pharmacopœia ; and that this communication and all others that shall be received from bodies which have appointed delegates to this Convention, should be referred to a committee of revision and publication to meet in Philadelphia as soon as practicable. As it is desirable that the committee here proposed should have the assistance of pharmaceutical bodies, it is recommended that authority be given to it to request the co-operation of Colleges of Pharmacy in the United States. A revising Committee thus constituted, and clothed with power to fill their own vacancies, to publish the work after the completion of the revision, and to take order on all incidental measures necessary to carry out the objects of the Convention, would, in the opinion of this Committee, form a body, to which the revision and publication of the Pharmacopœia might be safely trusted. To carry out these views, the Committee recommend the adoption of the following resolutions by the Convention :

“1. The communication from the College of Physicians of Philadelphia, and all other communications which may be received from bodies that have appointed delegates to this

Convention, shall be referred to a Committee of revision and publication, consisting of seven members, three of whom shall form a quorum.'

"2. The Committee thus constituted, shall meet in Philadelphia, and be convened as soon as practicable by its chairman.

"3. The Committee shall be authorized to request the co-operation of the Colleges of Pharmacy in the United States, to publish the work after the completion of the revision, and to take all other measures which they may deem necessary to carry into effect the object of the Convention.

"4. The Committee shall have power to fill its own vacancies.

"5. When the Committee shall have terminated their labors, they shall prepare a report of their proceedings, and transmit it to the Secretary of this Convention, to be laid before the next Convention."

All which is respectfully submitted.

FRANKLIN BACHE,	}	Committee.
JNO. W. DAVIS,		
WM. BACON STEVENS,		
JOSHUA J. COHEN,		
THEOPHILUS C. DUNN,		

Washington, Jan. 3, 1840.

The Convention then proceeded to choose the members of the Committee of revision and publication proposed in the above report, and Drs. Wood, Bache, Dunglison, Cohen, Dunn, Stevens, and Sewall, were appointed.

The Committee whose duty it was to arrange a plan for the organization of the next Convention, for revising the Pharmacopœia, made a report, which, at the suggestion of Dr. Stevens, was amended, so as to make the first Monday in May, 1850, the time for the meeting of the Convention, instead of the first Monday in January, 1850. The report thus amended, and modified in other respects to suit the change, was adopted by the Convention as follows:

"The Committee appointed to suggest a plan for organizing the next Convention, report, that they have taken the subject into consideration, and ask leave to submit the following reso-

lutions, which, with a few modifications, are the same as those adopted in 1830, for the organization of the present Convention.

"1. The President of this Convention shall, on the first day of May, 1849, issue a notice, requesting the several incorporated State Medical Societies, the incorporated Medical Colleges, the incorporated Colleges of Physicians and Surgeons, and the incorporated Colleges of Pharmacy, throughout the United States, to elect a number of delegates, not exceeding three, to attend a general Convention to be held at Washington, on the first Monday in May, 1850.

"2. The several incorporated bodies thus addressed shall also be requested by the President to submit the Pharmacopœia to a careful revision, and to transmit the result of their labors, through their delegates, or through any other channel, to the next Convention.

"3. The several medical and pharmaceutical bodies shall be further requested to transmit to the President of this Convention the names and residences of their respective delegates as soon as they shall have been appointed, a list of whom shall be published, under his authority, for the information of the medical public, in the newspapers and medical journals, in the month of March, 1850.

"4. In the event of the death, resignation, or inability to act of the President of the Convention, these duties shall devolve on the Vice President; and should the Vice President also be prevented from serving, upon the Secretary, or the Assistant Secretary, the latter acting in the event of the inability of the former."

GEORGE B. WOOD,
THOS. SEWALL,
ROBLEY DUNGLISON,

} Committee.

Washington, January 3, 1840.

The following resolutions were offered by Dr. Wood, and adopted by the Convention:

Resolved, 1st, That the Secretary take charge of and preserve the existing records until his successor be appointed by

the Convention of 1850, when it shall be his duty to hand them over to such successor; 2d, that in case of the death, resignation, or inability to act of the Secretary, his duties shall devolve upon the Assistant Secretary; and, 3d, that it be recommended to future Conventions to appoint their Secretary and Assistant Secretary from members residing in the District of Columbia.

Dr. Bond offered the following resolution, which was adopted:

Resolved, That the Committee of revision and publication be requested to take such measures as they may deem most effective, to induce physicians and apothecaries to adopt the nomenclature of the Pharmacopœia in their prescriptions and labels.

Dr. Dunglison offered the following resolution:

Resolved, That the officers of this Convention be requested to prepare forthwith for publication, such part of the transactions of this Convention as may seem to them to be adapted for making extensively known its important objects and proceedings, and that they be authorized to publish the same in the various medical journals of the United States, and in such of the daily and other newspapers as they may think proper.

This resolution was adopted, and it was made the duty of the Secretary and Assistant Secretary to carry it into effect.

Having transacted business of great interest to the medical profession of their country,—having passed votes of thanks to the officers of the Convention “for the able and dignified manner in which they had discharged their respective duties,” and to the Board of Aldermen of Washington for the use of their Hall,—the Convention, after a session of three days, characterized by a spirit of generous cordiality, which must contribute greatly to secure the objects for which they assembled, adjourned.

By order,

N. W. WORTHINGTON, Secretary.

HARVEY LINDSLY, Ass't Sec'ry.

P. S.—The medical journals throughout the United States are respectfully requested to copy the forgoing abstract of the proceedings of the Convention.

MISCELLANY.

On a new method of distinguishing Arsenic from Antimony, in cases of suspected poisoning by the former substance, by Mr. J. MARSH.—In testing for arsenic in cases of poisoning by that substance, it has always been desirable to render the process as simple as possible, and thereby divest the mind of any ambiguity on the subject. It was with this view, that I submitted to the Society of Arts, &c., in the year 1836, my process by hydrogen, a process that I then fondly hoped would have removed all difficulties; but a communication from my friend Mr. Lewis Thompson, and which was inserted in the London and Edinburgh Philosophical Magazine, vol. x, p. 353, has rendered the process, in some measure, more difficult than was at first supposed, by the discovery of that gentleman, of a compound in which antimony combines with hydrogen to form a gas (antimoniuretted hydrogen.) This gas gives off, by the process employed, metallic crusts, which much resemble, to the inexperienced eye, the metallic substance derived from arsenical solutions by the same arrangements. It becomes necessary, therefore, to find means of distinguishing these metallic crusts from each other. Many processes, which are well known to the experienced chemist, may be employed for this purpose; but the misfortune is, that all these arrangements suppose a previous chemical acquaintance with the subject; for instance, a good process is given for this purpose by Liebig and Mohr, in their valuable journal, (*Lieb. Ann.* xxiii, 217,) and also, a modification of the same by Berzelius may be seen copied in the *Lancet*, vol. i, 1838, p. 819, but these are all liable to the above objection, viz., a want of simplicity.

I am happy in being able to lay before your readers a very simple distinguishing test for these bodies, and which I have employed in all cases of doubt with perfect success. The means which I use are simply as follows: After the common arrangements have been made for testing for antimony or arsenic, the piece of glass or porcelain on which the metallic crusts are generally received, is to have a single drop of distilled water placed on it; the glass or porcelain is then to be inverted, so that the drop of water is suspended undermost. The gas, as it issues from the jet, is to be inflamed in the usual manner, but the piece of glass, &c., with its drop of water, is to be held about an inch above the jet, or just above the apex of the cone of the flame; the arsenic, by this arrangement, is oxidized

at the same time that the hydrogen is undergoing combustion, and coming in contact with the drop of water held above, forms with it a strong or weak solution of arsenical acid, according to the quantity of arsenic present, should that substance have been in the mixture submitted to examination. A very minute drop of Hume's test (the ammoniacal nitrate of silver) being now dropped on the solution so obtained, if arsenic be present, the well known characteristic lemon color produced by this test, when used for testing that substance, is immediately produced, namely, the insoluble arsenite of oxide of silver. Antimony, under these circumstances, from being insoluble, produces no change. I have found it useful, when much arsenic has been present in the matter submitted to examination, to use a clean glass tube, six inches long, and about half an inch in diameter. I slightly moisten the interior of the tube with distilled water, not allowing the hands or fingers to come in contact with the water: the tube thus prepared, is to be held vertically over the apex of the jet of burning gas. By these means a strong solution of the substance is obtained, and which may be tested with perfect ease by Hume's test, or any other of the usual tests employed for arsenic, &c.

I hope that the foregoing process will be found to possess all the delicacy and precision necessary for distinguishing these two bodies from each other, and that it will be the means of removing every doubt from the minds of the experimentalists in future.—*Lond. and Edin. Phil. Journ.*

Cissampeline a new vegetable base, by A. WIGGERS.—M. WIGGERS has announced that he has found in the root of the *Cissampelos Pareira*, a vegetable base, which he obtained by boiling this root several times in water containing sulphuric acid; and mixing the brown decoction with carbonate of soda; there is thus, a precipitate of a grayish brown color produced, which is washed with, and re-dissolved in water, acidulated with sulphuric acid. This solution is treated with animal charcoal; the carbonate of soda then forms a slightly yellow precipitate, which is dried, pulverised, and treated with successive portions of ether. There is obtained a solution almost colorless, which, on distilling off the ether, abandons the cissampeline; to purify completely this substance, it is dissolved in weak acetic acid; and again precipitated carbonate of soda from this weak solution which is to be slightly heated; it is to be carefully washed and dried, M. Wiggers proposes to publish hereafter, the results of more complete researches upon this base.

It is known, that M. Feneulle, who has likewise been occupied with the study of the *Pareira brava*, has pointed out the existence of a yellow bitter principle, in which the active properties of this root appear to reside, Is not this yellow bitter principle the cissampeline in an impure state?

A. G. V.

Ann. des. Pharm., and Jour. de Pharm.

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